

SDMS DocID

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OSEH

Occupational Safety &
Environmental Health

University of Michigan
Occupational Safety & Environmental Health
Campus Safety Services Building
1239 Kipke Drive, Ann Arbor, MI 48109-1010
Phone: 734 647-1143 • Fax: 734 763-1185

Terrance G. Alexander, Director

August 22, 2005

Harry R. Steinmetz (3HS62)
US Environmental Protection Agency, Region 3
1650 Arch Street
Philadelphia, PA 19103-2029

Re: Safety Light Corporation Site, Bloomsburg, Pennsylvania
Response to Inquiry of July 21, 2005 (received by UM July 26, 2005)

Dear Mr. Steinmetz:

The University of Michigan (UM) is responding to your request for information on the above referenced Safety Light Corporation Site (Site). Attached is a memorandum that provides a detailed inventory of radiation sources the University purchased from US Radium/Safety Light over the years, and a discussion of their final disposition. The following are specific responses to the questions asked in your information request.

1. *Describe in detail the business relationship between Michigan and Safety Light.*

The UM routinely purchases radiation sources from vendors for use in research activity. US Radium/Safety Light was a vendor that supplied small sources of strontium-90 (six sources from 1955-58), polonium-210 (two sources from 1965-66), americium-241 (thirty-seven sources from 1965-68), tritium (no record on number of sources from 1965-68), radium-226 (five sources in 1965), Isolite Pm-147 (one source, unknown year), and titanium tritide tritium targets (unknown number in 1980-90s). In addition the University purchased several Safety Light/Isolite self-luminous exit signs for use on campus. Detailed information on each of these sources is provided in the attached memorandum and copies of our file documentation.

2. *Did Michigan ever transport and/or broker hazardous substances and/or radioactive waste or other wastes that were disposed of or reclaimed by U.S Radium, Lime Ridge Industries, USR Industries, USR Metals, Metreal, Isolite to the Site?*

No, the University of Michigan is not a transporter or broker of waste materials for disposal.

3. *If you answered "yes" to Question 2, please answer the following questions: answered "no" to question 2.*

4. *Did Michigan ever generate radioactive waste or other waste that were disposed of or reclaimed by U.S Radium, Lime Ridge Industries, USR Industries, USR Metals, Metreal, Isolite at the Site?*

No. After an extensive search of our records, the University of Michigan found no documentation that we used any of the above listed firms for disposal of radioactive or other waste materials. The attached documentation goes into detail on the disposition of the source materials purchased from the above listed firms. During the time frame in question our disposal vendors for radioactive waste materials included: Nuclear Engineering Co. (currently US Ecology) with disposal at Morehead, Kentucky; Atomic Disposal Co. (currently ADCO, Inc.); US Ecology; and GTS Duratek.

Our records do indicate that four americium-241 sources out of 37 purchased were returned to US Radium (two in 1966 and two in 1967, each within one year of purchase). The leak test records attached to this letter indicate that after the laboratory processed the sources received from US Radium, the four that were returned measured material leakage on three and the fourth was received from US Radium with no leak test documentation. It is our speculation the sources were returned by the researcher because they were out of specification for the research project being performed, and as with any items that do not meet purchase specifications, they are returned to the vendor. We have no indication as to what US Radium did with the returned sources.

5. *If you answered "yes" to Question 4, please address the following issues: answered "no" to question 4.*

6. *If you have reason to believe there may be persons able to provide more detailed or complete responses to any question contained herein, or who may be able to provide additional responsive documents, provide the names, titles, areas of responsibility, current addresses, and telephone numbers of such persons as well as additional information or documents they may have.*

The University of Michigan has no reason to believe there are other records or persons available with more information on this inquiry.

7. *For each and every question contained herein, if information or documents responsive to this Information Request are not in your possession, custody, or control, then provide the names, titles, areas of responsibility, current addresses, and telephone numbers of the persons from whom such information or documents may be obtained.*

Documents responsive to the questions in this information request are within our control.

8. *If you have any other information about other party(ies) who may have information that may assist the Agency in its investigation of the Site, or who may be responsible for the generation of, transportation to, or release of contamination at the Site, please provide such information.*

The University of Michigan has no additional information we are aware of pertaining to the Site.

9. *If any of the documents solicited in this information request are no longer available, please indicate the reason why they are no longer available.*

Safety Light Corporation Site, Bloomsburg, Pennsylvania
Response to Inquiry of July 21, 2005
August 22, 2005
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To the best of our knowledge, we have provided the documents solicited in this information request where required by the question. We have no knowledge of other documents pertinent to this information request.

Based on the information in our files, it appears the University has returned only four (4) low activity Americium-241 sources to the Site for unknown future action by US Radium. Based on the information provided in this letter and the attachments, it appears the University of Michigan in a worst case scenario would have been connected with less than 110 gallons or less than 200 pounds of material that may have been handled by Safety Light, and all of which would have been handled prior to April 1, 2001. We request that EPA consider the University of Michigan under the de minimis exemption of 42 USC 9607(o)(1). Your response will be greatly appreciated. If you have any questions please give me a call at (734) 647-2253 or e-mail tgalex@umich.edu.

Sincerely,

A handwritten signature in black ink, appearing to read 'T. Alexander', with a long horizontal flourish extending to the right.

Terrance G. Alexander, PE, CIH
Director

Attachments: Records Review Memorandum
Information on Sources Identified in EPA Letter
Sources Used in Goddard Space Flight Center (GSFC) Project
Miscellaneous Sources

Copy to: H. Baier
T. Blessing

S:\ood\environmental issues/EPA Inquiry - Safety Light Site

RECORDS REVIEW MEMORANDUM



OSEH

Occupational Safety &
Environmental Health

University of Michigan
Occupational Safety & Environmental Health
Campus Safety Services Building
1239 Kipke Drive, Ann Arbor, MI 48109-1010
Phone: 734 647-1143 • Fax: 734 763-1185

Terrance G. Alexander, Director

TO: Terrance Alexander, Director
Occupational Safety and Environmental Health

FROM: Dennis A. Palmieri, Sr. OSEH Rep
Occupational Safety and Environmental Health

DATE: August 15, 2005

SUBJECT: EPA CERCLA Inquiry Letter of 21 July 2005

Per your request, I have searched departmental records for sealed sources to identify and assess the disposition of the radioactive sources manufactured by US Radium Corp / Safety Light and identified specifically by the EPA in its letter to the University of 21 July 2005. As part of that search, I noted that we retained records indicating the University acquired other sources from the same manufacturer. I have included a summary of these "miscellaneous" sources along with what is known about them.

In brief summary, I was able to locate the records for all except one of the sources noted by the EPA in its letter. The one source record I could not locate was for a Po210 source listed in the Safety Light ledger as having an activity of 0.625 mCi on 6/11/65. It should be noted that Po210 has a half-life of about 138 days and decays to a stable isotope. Records for all the other specified sources note that all were either disposed through an appropriate radioactive waste broker for burial in a licensed landfill or were transferred to other institutions.

However, other source records identifying sources acquired from US Radium Corp. indicate that four of 37 Am241 sources acquired by the University from US Radium Corp. were returned to the manufacturer in 1966 and 1967. There was no indication as to why the sources were returned. Two of the sources were accompanied by a notation indicating they were "scrapped". However, it is possible that the sources were not returned "for disposal" but were returned because they failed to meet research specifications. It doesn't appear to have been the practice to dispose of the other sources through return to the manufacturer. Most of the sources were transferred to the Goddard Space Flight Center. Other remaining sources apparently were collected by Radiation Control Service (predecessor to OSEH Radiation Safety Service) for disposal. Those sources were held in storage until May of 2003 when disposed by OSEH HM & RS through GTS Duratek.

In conclusion, as a customer of the US Radium Corp / Safety Light Co., the University of Michigan acquired radioactive sources as end-products for use in research and for safety lighting. While the University did return four discrete sources to the manufacturer in 1966-67 for unknown reasons, it does not otherwise appear that the UM made a practice of returning radioactive sources to US Radium / Safety Light for disposal.

Identification and Disposition of Sources Listed in Safety Light Material Ledger Sheet

1.0 Sources Identified in Material Ledger

The CERCLA inquiry letter ("EPA Letter") provided a copy of a ledger of radioactive sources supplied to the University of Michigan from US Radium Corp. in the early 1950s. Only two radionuclides were listed. Sr90, is an energetic beta emitter with a half-life of 28.8 years, and Po210, is an alpha emitter with a half-life of only 138.4 days.

The ledger listed six Sr90 sources and two Po210 sources:

Nuclide	Serial No.	Initial Activity (mCi)	Ledger Date
Sr90	377	20	3/1/1955
Sr90	378	20 ^(a)	3/1/1955
Sr90	985	18 ^(b)	9/26/1955 ^(c)
Sr90	986	18 ^(b)	9/26/1955 ^(c)
Sr90	987	18 ^(b)	9/26/1955 ^(c)
Sr90	13464	18	1/7/1958
Po210	55693	0.312	2/28/1966
Po210	none	0.625	6/11/1965

- The Ledger identifies the activity for this source as "60 mCi". This is likely an error. Contemporaneous UM records for that particular Sr90 source (s/n #378) consistently identify the nominal activity as 20 mCi. The lower activity designated in UM records corresponds with that for the other similar sources which were all obtained and used for the same purpose.
- The Ledger aggregates the total activity for the 3 sources (s/n 985, 986 and 987) as 54 mCi. That corresponds to 18 mCi per source which better corresponds to UM contemporaneous records of 20 mCi nominal per source.
- The Ledger Date for sources s/n 986, 987 and 988 does not specify the year the sources were supplied to the UM. Based upon the AEC approval period, and the pattern shown with the other sources in the Ledger, it is likely that the supply date is 9/26/55.

2.0 Historical Summary per University Records by Identified Source:

According to the Safety Light / US Radium Ledger, a number of the sources identified were issued to UM under letter authorizations issued by the US Atomic Energy Commission (AEC). These letter "licenses" were commonly used by the AEC prior to its drafting and implementing licensing regulations as required by the Atomic Energy Act of 1954. The University of Michigan obtained a license (21-00215-04) in accordance with the new regulations sometime in 1957 or 1958. Prior to that date, institutions or individual researchers could apply to the US AEC for letter authorizations approving receipt of particular sources from specific suppliers. During these early years, the University of Michigan appointed a Radiation Policy Committee to conform and centralize radiological safety, security and approvals. A service was formed in the later 1950s titled "Radiation Control Service" (RCS) to identify users of radioactive materials at the University and assist in the oversight of those uses. For that reason, the dates

on some of the records maintained by RCS for the sources listed in the EPA letter commence a few years after the source may have been supplied pursuant to the Ledger Date in the Safety Light Ledger. Radiation Control Service was the predecessor to what is now OSEH-Radiation Safety Service (RSS).

2.1 Sr-90 Source #377

US Radium Corp. / Safety Light records indicate that the UM order for this source was filled on 3/1/55. The company issued the source to UM under approval of AEC letter authorization number 31353 dated February 15, 1955. UM records for this source commence on 3/28/57. The source was used as a microphotometer light source by a Prof. Blackwell of the Vision Research Lab which was located in Rm. 21A of Mason Hall. It was briefly transferred to Willow Run Research Labs in September of 1958 (probably upon the departure of Prof. Blackwell to The Ohio State University sometime earlier). It was then collected for storage in the UM Radiation Control Service safe where it remained until disposal in 1969.

Disposal records indicate that the source was packaged as radioactive waste (along with Sr90 Source #986) in solid waste "barrel #12" sometime between May of 1969 and July of 1969. Barrel #12 along with its contents including Sr90 (with a total decay-corrected activity of 29.4 mCi accounting for both Sources #377 and #986) was listed on a Radioactive Waste Manifest #4719 dated July 9, 1969. Manifest #4719 listed radioactive materials intended for shipment to Nuclear Engineering Co (currently US Ecology) in Morehead, KY for burial at the radioactive waste site located there. A corresponding memo to file by Mr. N.L. Millis, Radiation Control Service Health Physicist indicates that the shipment to Nuclear Engineering Co. occurred on 14 July 1969 and was received at the site on July 21, 1969.

Copies of the Leak Test record, Manifest #4719 and the 14 July 1969 memo are attached.

2.2 Sr-90 Source #378

US Radium Corp. / Safety light records indicate that the UM order for this source was filled on 3/1/55. The company issued the source to UM under approval of AEC letter authorization number 31353 dated February 15, 1955. UM records for this source commence on 3/28/57. Line 5 of the Ledger states the source activity as 60 mCi. This appears to be in error. UM records identify the nominal activity as approximately 20 mCi. Similar sources were all apparently acquired for the same purpose in 1955 and 1956 and were all approximately 20 mCi. For that reason, it is likely that the Ledger notation is in error.

Source #378 was used as a microphotometer light source by a Prof. Blackwell of the Vision Research Lab which was located in Rm. 21A of Mason Hall. The source was transferred in September of 1958 to the UM Radiation Control Service storage safe where it remained until disposed in 1978 (probably upon the departure of Prof. Blackwell to The Ohio State University). Leak test records dated 21 March 1978 indicate the source was transferred to "Barrel #67" for disposal by Atomic Disposal Co. (currently ADCO, Inc) via burial.

Disposal packaging records for 21 March 1978 list the contents of Barrel #67 and specifically identify Source #378 by serial number (along with Source #13464). The packaging records note that the barrel was sent out 28 March 1978 as part of the 3d waste shipment for that year. Radioactive Waste Manifest No. 10926, dated 28 March 1978, confirms that the material was listed as part of that shipment.

Copies of the Leak Test record, Manifest #10926 and the UM Disposal Packaging Record for 3/21/78 are attached.

2.3 Sr-90 Source #985

US Radium Corp. / Safety Light records indicate that the UM order for this source was filled on what appears to be either 26 September 1955 or 1956. The notations are unclear. The company issued the source to UM under approval of AEC letter authorization number 35383 dated 26 August 1955.

UM records for this source commence on 3/28/57. The source was used as a microphotometer light source by a Prof. Blackwell of the Vision Research Lab which was located in Rm. 21A of Mason Hall. The leak test record indicates that the source was transferred to The Ohio State University sometime after 15 September 1958 in the care of Prof. Blackwell. It is likely that Prof. Blackwell left the UM to engage in academic and research pursuits at OSU and the source was transferred as part of that relocation. There are no other records indicating a return of the source to the UM.

A copy of the Leak Test Record is attached.

2.4 Sr-90 Source #986

US Radium Corp. / Safety Light records indicate that the UM order for this source was filled on what appears to be either 26 September 1955 or 1956. The notations are unclear. The company issued the source to UM under approval of AEC letter authorization number 35383 dated 26 August 1955.

UM records for this source commence on 3/28/57. The source was used as a microphotometer light source by a Prof. Blackwell of the Vision Research Lab which was located in Rm. 21A of Mason Hall. It was transferred to UM Radiation Control Service sometime between April and November of 1958 probably upon the departure of Prof. Blackwell to The Ohio State University. It was then transferred to the Willow Run Labs around May of 1959 where it remained until 1961. The source was returned to Radiation Control Service in 1961 due to some apparent degradation of the housing. It remained in storage until its disposal in 1969.

Disposal records indicate that the source was packaged as radioactive waste (along with Sr90 Source #377) in solid waste "barrel #12" sometime between May of 1969 and July of 1969. Barrel #12 along with its contents including Sr90 (with a total decay-corrected activity of 29.4 mCi accounting for both Sources #377 and #986) was listed on a Radioactive Waste Manifest #4719 dated July 9, 1969. Manifest #4719 listed radioactive materials intended for shipment to Nuclear Engineering Co (currently US Ecology) in Morehead, KY for burial at the radioactive waste site located there. A corresponding memo to file by Mr. N.L. Millis, Radiation Control Service Health Physicist indicates that the shipment to Nuclear Engineering Co. occurred on 14 July 1969 and was received at the site on July 21, 1969.

Copies of the Leak Test record, Manifest #4719 and the 14 July 1969 memo are attached.

2.5 Sr-90 Source #987

US Radium Corp. / Safety Light records indicate that the UM order for this source was filled on what appears to be either 26 September 1955 or 1956. The notations are unclear. The company issued the source to UM under approval of AEC letter authorization number 35383 dated 26 August 1955.

UM records for this source commence on 3/28/57. The source was used as a microphotometer light source by a Prof. Blackwell of the Vision Research Lab which was located in Rm. 21A of Mason Hall. The leak test record indicates that the source was transferred to The Ohio State University sometime after 15 September 1958 in the care of Prof. Blackwell. It is likely that Prof. Blackwell left the UM to engage in academic and research pursuits at OSU and the source was transferred as part of that relocation. There are no other records indicating a return of the source to the UM.

A copy of the Leak Test record is attached

2.6 Sr-90 Source #13464

This source was issued to the UM under its AEC Byproduct Materials License No. 21-00215-04. The date noted next to the Ledger entry is not likely to correspond to the shipment date because it is later than several of the entries in the UM Leak Test records corresponding to that source. The UM Leak Test record estimates a receipt date as sometime in 1956. The leak test records commenced on 10 November 1957.

The source was acquired by the Willow Run Laboratories with indication that it had been used as a light source originally by a Dr. Gordon of the "Radar Lab" at that facility. The source remained in use at Willow Run until 1969 when it was collected for storage in the RCS safe. Leak test records dated 21 March 1978 indicate the source was transferred to "Barrel #67" for disposal by Atomic Disposal Co. (currently ADCO, Inc) via burial.

Disposal packaging records for 21 March 1978 list the contents of Barrel #67 and specifically identify Source #378 by serial number (along with Source #378). The packaging records note that the barrel was sent out 28 March 1978 as part of the 3d waste shipment for that year. Radioactive Waste Manifest No. 10926, dated 28 March 1978, confirms that the material was listed as part of that shipment.

Copies of the Leak Test record, Manifest #10926 and the UM Disposal Packaging Record for 3/21/78 are attached

2.7 Po-210 Source #55693 of 1966; 0.312 mCi

Leak test records for this source identify it as having been received at University of Michigan on 2/28/66 although the record does not identify the source specifically by serial number. The source was used by a Prof. Bach at the Fluids Laboratory (now G.G. Brown Bldg) which housed the Civil Engineering Dept.

The source was retained for use in that laboratory until, at least, 23 June 1970. The leak test records indicate that the source had decayed to a level that no longer required monitoring. No other records could be found regarding disposal of the source. It appears that the source was retained until it had decayed to a level indistinguishable from that of background radiation. Po-

210 has a half-life of only 138.4 days. The remaining source activity as of 23 June 1970 would have been 0.00012 mCi.

A copy of the Leak Test record is attached.

2.8 Po-210 Source of 6/11/65, 0.625 mCi (no serial number)

No leak test records could be found identifying this source. However, it is likely that it was held for use or in storage in the same manner as Po-210 source #55693 until nearly all residual radioactivity had decayed. Po210 has a half-life of only 138.4 days and decays to a non-radioactive daughter product.

Identification of Other Sources Acquired from USRC / Safety Light Not Noted by EPA

A search of UM records indicate that the University obtained other sources from US Radium Corporation / Safety Light. Almost all of these appear to have been disposed using radioactive waste brokers. However, records for four discrete Am-241 sources indicate those sources were returned to US Radium Corp.

3.0 Americium 241 Sources for Space Physics Research Labs (SPRL)

A memo, dated 3/13/68, sent to the PML Health Physicist at the time, Mr. N. Millis, included an inventory of 37 discrete Am241 sources that were acquired from the US Radium Corp from 1965 through 1968. These sources were part of a research program conducted by a Prof. Horvath of the Space Research Labs. The sources were also under the charge of a Mr. Handy, an engineering research associate apparently involved in the research project. The research project was tied to the Goddard Space Flight Center (GSFC) in some manner as many of the 37 sources listed were transferred to the GSFC according to the inventory and as indicated by some GSFC transfer logs included with the inventory sheets.

The inventory specifically notes that four of the 37 Am241 sources, identified as Source Nos. 5P, 6P, 11P and 12P, were returned to US Radium Corp. Source 5P was returned on 5/25/66. Source 6P was returned on 10/26/66, the other two sources were returned sometime in November of 1967 with the notation "scrapped".

The other remaining sources were transferred to the GSFC, disposed as radioactive waste through the University's Radiation Control Service (now OSEH/ Radiation Safety Service) or retained in storage. Additional sources were later acquired in 1970 from a separate, unrelated vendor. There is an inventory record of two sources acquired on 12/21/70 from "NRD" which likely refers to NRD, Inc—a separate, unaffiliated producer of radioactive sources that is still in business.

It appears that any remaining Am-241 sources were disposed by OSEH / HM & RS in May of 2003 through GTS Duratek in a shipment of an estimated 40 mCi (without decay correction) of Am241 sources. These were collected from the SPRL many years back by RCS—likely sometime in the late 1980s. They were held in storage for many years at the old N. University Bldg facility and, later, at the Beck Road Storage Facility until adequate disposal options became available again.

3.1 Tritium Sources for Space Physics Research Labs (SPRL):

The 3/13/68 memo also references tritium sources noting that they are no longer at UM. GSFC transfer records dated June 14, 1966 show that these sources were all transferred to the GSFC. The transfer records note that these were all produced by US Radium Corp.

4.0 Radium Static Eliminator

Other sources identified included a static eliminator device containing a series of five Ra-226 sources as used by a Prof. Tourtelotte in Kresge II Bldg. Records indicate that these were manufactured by the US Radium Corp. All the sources were eventually transferred to the Veterans Administration Hospital in Los Angeles in 1971. A letter from the VA Hospital acknowledging the transfer is attached.

5.0 Pm-147 "Isolite" Source

A single record identifies a Pm-147 source used by a Prof. Hays. There is no indication of the origin of the source however it is described as an "Isolite" which is a product name used by Safety Light Corp. The source record indicates it was disposed in Barrel #147 on 10/11/73 and shipped to Nuclear Engineering Co. at Morehead, KY for disposal by burial.

6.0 Titanium Tritide Targets

Also, a number of sources were received by Prof. Glenn Knoll of Nuclear Engineering for use in a neutron generator during the 1980 and 1990s. The sources were up to 5 Ci of titanium tritide (H3) each and manufactured by Safety Light. A copy of a Safety Light MSDS was included by Prof. Knoll in one of his authorization applications identifying it as the vendor.

These sources typically were collected by RCS / RSS for storage at PML until disposal for burial through a waste broker (e.g. ADCO or US Ecology). The current Radiation Safety Officer was the N. Campus Health Physicist during much of the time when this research program was in effect. He indicates his practice was to entomb the sources in a steel drum filled with concrete. These were then shipped to a radioactive waste broker. In addition, RSS sealed source records show that Alan Jackson, former OSEH Health Physicist, disposed of a number of these sources through US Ecology in 1997. Others were transferred to the University of Texas that same year along with the neutron generator machine. There was never any practice of returning these sources to the manufacturer.

7.0 Self-luminous Exit Signs

Finally, from time-to-time, the University acquired Safety Light / Isolite self-luminous "exit" signs for use on campus. There are no particular records of these purchases because they were acquired under general license. Current construction guidelines discourage the acquisition of these signs.

OSEH maintains a sign retrieval program. Self-luminous signs are retrieved and sent for recycling. OSEH HM & RS records note that several Isolite signs were sent to SRB Technologies in Winston-Salem, NC for recycling. SRB is an independent manufacturer of self-luminous signs.

At this time, there are three additional Isolite signs in OSEH inventory. Two are at the NCTF and one is in the locked cabinet in Rm. 1503 of the CSSB. These will likely be sent to SRB for recycling.

INFORMATION ON SOURCES IDENTIFIED IN EPA LETTER

Mason Hall

Sr⁹⁰

20 mc

1956?

Sr⁹⁰ sulphate(Blackwell)
Vision Research

377

thick walled glass-metal backing

Wireless gas proportional detector 17-12-61
Wet smear - G.M. rate meter or scaler

3-28-57	No detectable activity	Room 21A	6-16-65	< 0.005 μ c	No detectable	RCS safe
1-5-58	No detectable activity	Room 21A	12-29-65	< 0.005 μ c	No detectable	RCS safe
9-15-58	No detectable activity	Willow Run	6-8-66	< 0.005 μ c	No detectable	RCS safe
3-20-59	No detectable activity	R.C.S. safe	12-14-66	< 0.005 μ c		R.C.S. Safe
9-4-59	No detectable activity	R.C.S. safe	6-2-67	< 0.005 μ c		R.C.S. Safe
3-18-60	No detectable activity	R.C.S. safe	12-18-67	< 0.005 μ c		RCS Safe
9-22-60	No detectable activity	R.C.S. safe	6-12-68	< 0.005 μ c		RCS Safe
6-20-61	No detectable activity	R.C.S. safe	12-19-68	< 0.005 μ c		RCS Safe
12-12-61	No detectable activity	RCS safe				
6-22-62	No detectable activity	RCS safe				
12-10-62	No detectable activity	RCS safe				
6-19-63	No detectable activity	RCS safe				
12-4-63	No detectable activity	RCS safe				
6-9-64	< 0.005 μ c No detectable	RCS safe				
12-20-64	< 0.005 μ c No detectable	RCS safe				

Disposed of May - 1969



THE UNIVERSITY OF MICHIGAN
PHOENIX MEMORIAL LABORATORY

Memo To: Waste Shipment File

From : N. L. Millis
Health Physicist

Date : July 17, 1969

Subject : Shipment of Radioactive Waste To Nuclear Engineering Corporation, July 14, 1969.

A shipment of fifteen (15) 55 gallon steel drums containing radioactive waste was dispatched from PML on July 14, 1969 via Associated Truck Lines. Its destination was the Nuclear Engineering Corporation waste burial ground in Moorehead, Kentucky. The following is a description of that shipment:

Barrels No. 1 through No. 11

Laboratory waste packaged by RCS on Main Campus and transferred to PML for pickup by Associated Truck Lines.

Barrel No. 12

Sealed sources as follows:

Co-60	80 mCi	RCS
Sr-90	20 mCi	2 light sources
Co-60	250 mCi	PML
Tm-170	0.3 mCi	Marine Eng. Dept.
Tm-170	0.1 mCi	Chem. and Met. Dept.
Ra-226	25 mCi	RCS
Sr-90	9.4 mCi	Dr. Ramavatram (?)
Yb-169	0.1 mCi	RCS
Po-Be	0.1 mCi	(?)
Ra-226	10 mCi	RCS

Two large gears (from Willow Run) 10 mCi Fe-55
70 millirem/hr. contact barrel
6 millirem/hr. @ 1 meter
Weight - 1000 lbs.

Barrel No. 13

Iron pipes from Bromine-82 preparation approximately 500 mCi Fe-55,
500 mCi Fe-57, 100 mCi Ag-110 m
Sealed sources; 2 mCi Ir-192
60 millirem/hr. contact barrel
6 millirem/hr. @ 1 meter
Weight - 1000 lbs.

NUCLEAR ENGINEERING CO., INC.

P. O. BOX 146 - BURNS BLDG.
MOREHEAD, KENTUCKY

COWELL, CALIFORNIA
P. O. BOX 594, WALNUT CREEK, CALIFORNIA

P. O. BOX 356
BEATTY, NEVADA

1. Transport Index
2. Transport Group
3. Type: Quantity/4. Label Required

RADIOACTIVE SHIPMENT RECORD FORM

4719

FROM: UNIVERSITY OF MICHIGAN, RADIATION CONTROL SERVICE DATE July 9, 1969 196

1121 Catherine Street, Ann Arbor, Michigan 48104 PAGE 1 OF TWO PAGES

INSTRUCTIONS

1. COMPLETE THIS FORM IN TRIPLICATE ON EACH SHIPMENT OF RADIOACTIVE MATERIALS TO NUCLEAR ENGINEERING CO., INC. USE AS MANY PAGES AS NECESSARY.
2. Where more than one isotope is included in a package, indicate each isotope, its quantity, and its quantity on a separate line. A single entry may be made in the first column, but these must clearly relate to the isotope listing. When mixed fission product wastes are involved, record each isotope in column 2.
3. On the shipping label, list only the most hazardous isotope in any package.
4. Indicate whether contents are solid, liquid or gaseous in column 2.
5. In last column place a check mark when the package meets the requirements listed below. (Reference is made to 10CFR20, as amended.)
 - A. Each package has been suitably marked with the words, "CAUTION RADIOACTIVE MATERIALS" (Per. 20.203, 20.401, & 20.402)
 - B. Each package has been suitably marked to show the isotope(s) contained, the net quantity, and the date of measurement. (Per. 20.203, 20.401, & 20.402)
 - C. Each package has been inspected and surveyed, with appropriate notations being made as to surface contamination, and the maximum radiation level at contact (two inches) and at one meter from the package surface. (Per. 20.401, (c))

ITEM NO.	PHYSICAL STATE	RADIATION, MR/HR		PRINCIPAL ISOTOPES	MILLCURIES BY-PRODUCT	GROSS WEIGHT	3. PRIORITY SOURCE 4.	CUBIC FEET	FINAL CHECK
		AT 2"	AT 1 METER						
#1	Solid	2.35	0.35	C ¹⁴ , H ³ , Z ⁶⁵	1.0, 30, .1	211 IV	A/RVII	7.3	✓
				H ³ , I ¹³¹	.1, .01				
#2	Solid	0.35	0.05	H ³ , H ³	500, 200, .1	all IV	A/RVII	7.3	✓
				I ¹²⁵ , C ¹⁴	.11, 3.1	II, III			
#3	Solid	7.0	0.55	H ³ , S ³⁵ , S ³⁵	3.0, 10, .1	all IV	A/RVII	7.3	✓
				Ca ⁴⁵ , Na ²²	.1, .1				
#4	Solid	.15	0	H ³ , C ¹⁴ , P ³²	100, 2.0, 1.0	all IV	A/RVII	7.3	✓
#5	Solid	5.0	1.0	C ¹⁴ , H ³ , I ¹²⁵	5.0, 30, .1	all IV	A/RVII	7.3	✓
				I ¹³¹ , Na ²²	.01, .2	II, III			
#6	Solid	1.0	0.2	H ³ , H ³ , I ¹²⁵	12.1, 5.0, 101	II, III, IV	A/RVII	7.3	✓
				Na ²²	.2	II			
#7	Solid	5.0	1.5	H ³ , C ¹⁴ , Na ²²	5, 3, .5	all IV	A/RVII	7.3	✓
				Na ²² , I ¹²⁵ , I ¹³¹	.01, .01, .01	II, III, IV			
#8	Solid	0.0	0	H ³ , C ¹⁴	1.0, 0.0	II, III	A/RVII	7.3	✓
				I ¹²⁵ , Na ²⁴	1001, .03	III, IV			
#9	Solid	7.0	0.55	I ¹³¹ , Na ²⁴	.01, .5	III, IV	A/RVII	7.3	✓
				H ³ , C ¹⁴ , P ³²	3.0, 20, .1	all IV			
#10	Solid	3.0	1.0	S ³⁵ , S ³⁵ , Na ²²	.01, .01, .2	all IV	A/RVII	7.3	✓
				C ¹⁴ , H ³ , C ¹⁴	3.0, 20, .1	all IV			
#11	Solid	.5	0	S ³⁵ , I ¹²⁵	.001, .01	II, III	A/RVII	7.3	✓
				I ¹³¹ (Natural)	.01, .01	II, III	A/RVII		

B03877

ORIGINAL

TO NUCLEAR ENGINEERING CO., INC.

RADIOACTIVE SHIPMENT RECORD FORM

CONTINUATION SHEET

FROM UNIVERSITY OF MICHIGAN, RADIATION CONTROL SERVICE DATE July 9, 1969 196

1121 Catherine Street, Ann Arbor, Michigan 48104 PAGE two OF two

ITEM NO.	PHYSICAL STATE	RADIATION, MR/HR		PRINCIPAL ISOTOPE(S)	MILLCURIES BY-PRODUCT	2. CONTAINER	3. POSSIBLE SOURCE	CUBIC FEET	FINAL CHECK
		AT 2'	AT 1 METER						
#12	SOLID	60	6	Co-60	330.	III	B/RyIII	7.3	✓
				Sr-90	29.4	II			
				Fe-55	10.0	IV			
				Tm-170	0.4	III			
				Yb-169	0.1	IV			
				Ra-226	35	I			
#13	SOLID	60	6	Fe-55	500	IV	A/RyIII	7.3	✓

29.4 mCi = Decayed total
activity for 2 sources (4.377×10^4)
of 20 mCi each from
1966 - 1969

[Handwritten signature]

[illegible]

ORIGINAL

803878

PIT NO. 28
ORIGINATOR NO. 152

15-55'S

DATE REC'D JUL 21 1969

CUBIC FEET SOLID	<u>110.25</u>
GALLONS LIQUID	<u>0.75</u>
CURIES SOLID	<u> </u>
LIQUID	<u> </u>
TOTAL	<u> </u>
GRAMS SNM SOLID	<u> </u>
LIQUID	<u> </u>
TOTAL	<u> </u>
LBS SOURCE SOLID	<u>48.00</u>
LIQUID	<u> </u>
TOTAL	<u> </u>
BY <u>[Signature]</u>	<u> </u>

RECEIVED
JUL 21 1969

B03879

8/2/69

Marion Hall

Wet smear - G. M. & scaler

Sr^{90}

20 mc

1956?

Sr^{90} sulphate

^{3rd} Mr. Miller
(Blackburn)

378

thick walled glass - metal backing

Vision Research

3-28-57	No detectable activity	Room 21A	6-16-65	< 0.005 μC - No detectable RCS safe	
1-5-58	No detectable activity	Room 21A	12-1-65	< 0.005 μC - No detectable RCS safe	
9-15-58	No detectable activity	R.C.S. safe	12-29-65	< 0.005 μC - No detectable RCS safe	
3-20-59	No detectable activity	R.C.S. safe	6-8-66	< 0.005 μC - No detectable RCS safe	
9-4-59	No detectable activity	R.C.S. safe	12-14-66	< 0.005 μC	R.C.S. Safe
3-18-60	No detectable activity	R.C.S. safe	6-8-67	< 0.005 μC	R.C.S. Safe Room 101
9-22-60	No detectable activity	R.C.S. safe	6-20-67	< 0.005 μC	2062 W. R.
6-20-61	No detectable activity	R.C.S. safe	Supernum - R. B. Miller		
12-12-61	No detectable activity	R.C.S. safe	RCS 101# 68030 Exp 3-1-69		
6-22-62	No detectable activity	R.C.S. safe	6-27-68	< 0.005 μC - no detectable RCS Safe	
12-11-62	No detectable activity	RCS safe	12-19-68	< 0.005 μC	RCS Safe
6-19-63	No detectable activity	RCS safe	9-20-69	< 0.005 μC no detectable	RCS Safe
12-4-63	No detectable activity	RCS safe	5-22-70	< 0.005 μC	R.C.S. Safe
6-9-64	< 0.005 μC No detectable activity	RCS safe	this continued		
12-20-64	< 0.005 μC - No detectable RCS safe				

RADIATION CONTROL SERVICE

St⁹⁰

20 mci

1963

St⁹⁰ sulphate

378

thick walled glass - metal backed

Solari

Irradiate Source

3/21/78

Packed in barrel #67 for disposal
by Atomic Export Co. by barrel

12-7-70	<0.005 μ ci	R.C.S. SAFE
6-17-71	<0.005 μ ci	R.C.S.
11-15-71	<0.005 μ ci \checkmark	RCS Safe
5-4-72	<0.005 μ ci \checkmark	RCS Safe
10-3-72	<0.005 μ ci \checkmark	RCS Safe
4-11-73	<0.005 μ ci \checkmark	RCS SAFE
10-10-73	<0.005 μ ci \checkmark	RCS SAFE
4-9-74	<0.005 μ ci \checkmark	RCS SAFE
10-14-74	<0.005 μ ci \checkmark	RCS SAFE
4-17-75	<0.005 μ ci \checkmark	RCS SAFE - 1112 NUB
10-17-75	<0.005 μ ci \checkmark	1112 NUB
4-12-76	223 <0.005 μ ci \checkmark	1112
10-21-76	<0.005 μ ci \checkmark	" "
4-4-77	<0.005 μ ci \checkmark	" "
10-24-77	<0.005 μ ci \checkmark	" "

1978

RADIATION CONTROL SERVICE

DISPOSITION OF RADIOACTIVE WASTE

Liquid/Solid

ROOM #	WASTING	NAME	ISOTOPE(S)	DATE COLLECTED	L/S	VOL/WT	BOTTLE # BARREL #	DATE PACKED	LC #
6741	Med Sci	Claplin	^{125}I	3-15-78	S	40	194	3-17-78	65
2056	Nat Sci	Kleinmith	^{32}P , ^{35}S	3-15-78	S	11	195	3-17-78	65
4216	Dental	Duach	^{3}H , ^{14}C	3-16-78	S	22	196	3-17-78	65
5522	U. Hospital	Corey	^{125}I , ^{131}I , ^{111}In , ^{133}Xe , ^{67}Ga , $^{99\text{m}}\text{Tc}$	3-17-78	S	21	197	3-20-78	66
5522	U. Hospital	Corey	^{125}I , ^{131}I , ^{111}In , ^{133}Xe , ^{67}Ga , $^{99\text{m}}\text{Tc}$	3-17-78	S	20	198	3-20-78	66
4204	Dental	Lopatin	^{3}H	3-17-78	S	26	199	3-20-78	66
5323	Med Sci	Rittenhouse	^{125}I , ^{14}C , ^{35}S	3-17-78	S	25	200	3-20-78	66
2242	Med Sci	Midgley	^{125}I , ^{32}P	3-10-78	L	20	212	3-21-78	67
3232	Med Sci	England	^{125}I	3-16-78	L	20	222	3-21-78	67
5323	Med Sci	Rittenhouse	^{125}I	3-17-78	L	10	227	3-21-78	67
5323	Med Sci	Rittenhouse	^{125}I , ^{14}C	3-17-78	L	10	228	3-21-78	67
5323	Med Sci	Rittenhouse	^{125}I	3-17-78	L	10	229	3-21-78	67
2242	Med Sci	Midgley	^{125}I	3-20-78	L	20	234	3-21-78	67
4412	Med Sci	Kolby	^{125}I , ^{3}H , ^{14}C	3-21-78	L	8	239	3-21-78	67
4412	Med Sci	Kolby	^{125}I , ^{3}H , ^{14}C	3-21-78	L	8	240	3-21-78	67
4412	Med Sci	Kolby	^{125}I , ^{3}H , ^{14}C	3-21-78	L	8	241	3-21-78	67
1112	N.U.B. (Safe)	—	^{90}Sr #13464 source	3-14-78	S	—	C-17	3-21-78	67
1112	N.U.B. (Safe)	—	natural U^{238}	3-14-78	S	—	C-18	3-21-78	67
1112	N.U.B. (Safe)	—	^{90}Sr #378 20mCi	3-14-78	S	—	C-19	3-21-78	67
1112	N.U.B. (Safe)	—	^{137}Cs 1mCi	3-14-78	S	—	C-20	3-21-78	67
1112	N.U.B. (Safe)	—	natural U^{238}	3-14-78	S	—	C-21	3-21-78	67

1978

DISPOSITION OF RADIOACTIVE WASTE

Liquid/Solid

ROOM & BUILDING	NAME	ISOTOPES	DATE COLLECTED	L/S	VOL/WT	BOTTLE # BARREL #	DATE PACKED	DRUM
1120 W. Hospital	Menon	¹²⁵ I	3-21-78	S	47	206	3-22-78	67
7734 Med Sci	Davenport	¹²⁵ I, ¹²⁵ I	3-17-78	S	14	201	3-22-78	68
3232 Med Sci	England	¹²⁵ I, ³ H	3-20-78	S	48	202	3-22-78	68
123 Neuroscience	Romanoff	³² P, ³ H, ¹⁴ C	3-21-78	S	39	204	3-22-78	68
7727 Med Sci	Mahieu	¹²⁵ I, ³ H	3-21-78	S	33	205	3-22-78	68
Ashes from Urn at N. Campus		⁸⁵ Sr, ⁴⁶ Ca, ¹⁴¹ La, ³¹ P	—	S	400	—	—	69
2242 Med Sci	Midgley	¹²⁵ I	3-21-78	S	31	207	3-22-78	69
7713 Med Sci	Jacques	¹⁴ C, ³ H	3-22-78	S	12	209	3-22-78	69
Animals	—	¹²⁵ I, ⁸⁵ Sr, ⁴⁶ Ca	—	S	200	—	3-28-78	70
Animals	—	¹²⁵ I, ¹³¹ I	—	S	200	—	3-28-78	71
Animals	—	¹²⁵ I, ⁶⁷ Ga, ⁸⁵ Sr, ⁴⁶ Ca	—	S	200	—	3-28-78	72
Animals	—	¹²⁵ I	—	S	200	—	3-28-78	73
Animals	—	¹²⁵ I	—	S	200	—	3-28-78	74
Animals	—	¹²⁵ I	—	S	200	—	3-28-78	75
Animals	—	¹²⁵ I	—	S	200	—	3-28-78	76
Animals	—	¹²⁵ I	—	S	200	—	3-28-78	77
Animals	—	¹²⁵ I	—	S	200	—	3-28-78	78
Animals	—	¹²⁵ I	—	S	200	—	3-28-78	79
Animals	—	¹²⁵ I	—	S	200	—	3-28-78	80
Animals	—	¹²⁵ I, ⁶⁷ Ga	—	S	200	—	3-28-78	81
Animals	—	¹²⁵ I, ⁸⁵ Sr, ⁴⁶ Ca	—	S	200	—	3-28-78	82

SHIPMENT #3 TUESDAY MARCH 28, 1978 36 drums (5 rumenals) 13 animals 11 Vial drums

ATOMIC DISPOSAL CO., INC.

10926

P.O. BOX 35 • TINLEY PARK, ILLINOIS 60477 • 312/429-1860

U.S. NRC LICENSE NO. 12-1126-1

ILL. LICENSE NO. IL 00004-01

DATE: 3/28/78

RADIOACTIVE SHIPMENT RECORD

DISCLAIMER: Upon acceptance of shipment, the materials therein become the sole property of ATOMIC DISPOSAL CO., INC.

CUSTOMER: J. A. M. RADIATION CONTROL SERVICE

NAME

Page 1 of 2 Pages

ADDRESS: 101 N. LINN BLVD. ANN ARBOR, MICH 48109

CUSTOMER ORDER NO.

MATERIAL DESCRIPTION: Dry RADIOACTIVE WASTE

CONTAINER DESCRIPTION: 55 Gallon STEEL DRUM

Container Size	Estimated Weight	Physical State	CHEMICAL FORM	PRINCIPAL RADIOACTIVE ISOTOPES	Activity	Source	SN	Label Used	Exposure Rate	Remarks
55 Gallon Steel Drum	1000	Solid	DRY WASTE	Co-60	1000	1000	1000	RADIOACTIVE WHITE ONE	1000	
215	100	Solid		Co-60	100	100	100			
310	100	Solid		Co-60	100	100	100			
380	100	Solid		Co-60	100	100	100			
205	100	Solid		Co-60	100	100	100			
220	100	Solid		Co-60	100	100	100			
200	100	Solid		Co-60	100	100	100	RADIOACTIVE YELLOW TWO	2.0	9.5
205	100	Solid		Co-60	100	100	100	RADIOACTIVE WHITE ONE	1000	1000
170	100	Solid		Co-60	100	100	100			
510	100	Solid		Co-60	100	100	100			
130	100	Solid		Co-60	100	100	100			
400	100	Solid		Co-60	100	100	100			
750	100	Solid		Co-60	100	100	100	No Label Required	1000	1000
195	100	Solid		Co-60	100	100	100	RADIOACTIVE WHITE ONE	1000	1000
210	100	Solid		Co-60	100	100	100			
260	100	Solid		Co-60	100	100	100	RADIOACTIVE YELLOW TWO	4.9	16.3
190	100	Solid		Co-60	100	100	100	RADIOACTIVE WHITE ONE	1000	1000
400	100	Solid		Co-60	100	100	100			

IS TO CERTIFY THAT THE ABOVE ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELED, AND IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE DEPARTMENT OF TRANSPORTATION.

ATOMIC DISPOSAL AGENT

Signature

Date

Time

Customer Signature

Date

CUSTOMER COPY

109210 (cont)

U.S.N.R. G. LICENSE NO. 12-11256-1 I.C. LICENSE NO. 12-00304-01

DATE: 2/28/78

With the acceptance of shipment, the materials therein become the sole property of ATOMIC DISPOSAL CO., INC.

NAME _____ Page 2 of 2

ORDER NO.

MATERIAL DESCRIPTION	DECONTAMINATIVE LUBRICANT	ITEM	1	QUANTITY	1	UNIT	EA	00	UTN &L DEW
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[illegible]

IS TO CERTIFY THAT THE ABOVE ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELED, AND IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE DEPARTMENT OF TRANSPORTATION.

ATOMIC DISPOSAL AGENT

Signature [Signature]

Date 3-24-71 Time 11:00

CUSTOMER COPY

Marion Hall

Wet smear - G.M. & scales

Sr⁹⁰

20 mc

1956?

Sr⁹⁰ sulfate

(Blackwell)

985

thick walled glass-metal backing

Vision Research

3-28-57 No detectable activity Room 21A
1-11-58 No detectable activity Room 21A
9-15-58 No detectable activity Room 3433

Sent to Ohio State in care of Prof. Blackwell

Mason Hall

Str⁹⁰

20 mc

1956?

Str⁹⁰ sulphate

(Blackwell)
Vision Research

986

thick walled glass - metal backing

Windowless gas proportional detector 12-12-61
Wet smear - G.M. & scales

3-28-57	No detectable activity	Room 21A	12-4-63	No detectable activity	RCS safe
1-5-58	No detectable activity	Room 21A	6-9-64	No detectable activity	> 0.005 mc RCS safe
4-28-58	No detectable activity	Room 21A	12-20-64	< 0.005 mc - No detectable	RCS safe
11-21-58	No detectable activity	R.C.S. safe Trytten	6-16-65	< 0.005 mc - No detectable	RCS safe
5-22-59	No detectable activity	Willow Run	12-29-65	< 0.005 mc - No detectable	RCS safe
11-17-59	No detectable activity	Willow Run	6-8-66	< 0.005 mc - No detectable	RCS safe
Contact Joe Mundar, Infa Raddah.		Bldg. 41	12-14-66	< 0.005 mc	R.C.S. Safe
3-21-60	No detectable activity	Bldg. 41	6-8-67	< 0.005 mc	R.C.S. Safe
9-22-60	No detectable activity	Bldg. 41	12-18-67	< 0.005 mc; No Detectable	R.C.S. Safe
6-20-61	Source proper appears to be cracking.		6-12-68	< 0.005 mc	RCS Safe
Has been removed from location - all			12-19-68	< 0.005 mc	RCS Safe
6-21-61	No detectable activity	R.C.S. safe	disposed of May - 1969		
12-12-61	No detectable activity	RCS safe			
6-22-62	No detectable activity	RCS safe			
12-1-62	No detectable activity	RCS safe			

THE UNIVERSITY OF MICHIGAN
PHOENIX MEMORIAL LABORATORY

Memo To: Waste Shipment File

From : N. L. Millis
Health Physicist

Date : July 17, 1969

Subject : Shipment of Radioactive Waste To Nuclear Engineering Corporation, July 14, 1969.

A shipment of fifteen (15) 55 gallon steel drums containing radioactive waste was dispatched from PML on July 14, 1969 via Associated Truck Lines. Its destination was the Nuclear Engineering Corporation waste burial ground in Moorehead, Kentucky. The following is a description of that shipment:

Barrels No. 1 through No. 11

Laboratory waste packaged by RCS on Main Campus and transferred to PML for pickup by Associated Truck Lines.

Barrel No. 12

Sealed sources as follows:

Co-60	80 mCi	RCS
Sr-90	20 mCi	2 light sources
Co-60	250 mCi	PML
Tm-170	0.3 mCi	Marine Eng. Dept.
Tm-170	0.1 mCi	Chem. and Met. Dept.
Ra-226	25 mCi	RCS
Sr-90	9.4 mCi	Dr. Ramavatram (?)
Yb-169	0.1 mCi	RCS
Po-Be	0.1 mCi	(?)
Ra-226	10 mCi	RCS

Two large gears (from Willow Run) 10 mCi Fe-55
70 millirem/hr. contact barrel
6 millirem/hr. @ 1 meter
Weight - 1000 lbs.

Barrel No. 13

Iron pipes from Bromine-82 preparation approximately 500 mCi Fe-55,
500 mCi Fe-57, 100 mCi Ag-110 m
Sealed sources; 2 mCi Ir-192
60 millirem/hr. contact barrel
6 millirem/hr. @ 1 meter
Weight - 1000 lbs.

P. O. BOX 146 - BURNS BLDG.
MOREHEAD, KENTUCKY

NUCLEAR ENGINEERING CO., INC.

COWELL, CALIFORNIA
P. O. BOX 594, WALNUT CREEK, CALIFORNIA

P. O. BOX 356
BEATTY, NEVADA

1. Transport Index
2. Transport Group
3. Type: Quantity/4. Label Required

RADIOACTIVE SHIPMENT RECORD FORM

4719

FROM: UNIVERSITY OF MICHIGAN, RADIATION CONTROL SERVICE DATE July 9, 1969 196

1121 Catherine Street, Ann Arbor, Michigan 48104 PAGE 1 OF TWO PAGES

INSTRUCTIONS

1. COMPLETE THIS FORM IN TRIPLICATE IN EACH SHIPMENT OF RADIOACTIVE MATERIAL TO Nuclear Engineering Co., Inc. USE AS MANY PAGES AS NECESSARY.

2. Where more than one isotope is included in a package, indicate each isotope, isotope and its quantity on a separate line. A single entry may be made in the first column, but there must clearly relate to the multi-isotope listing. When mixed fission product wastes are involved, record ALL isotopes in column 2.

3. On the shipping label, list only the most hazardous isotope in any package.

4. Indicate whether contents are solid, liquid or gaseous in column 2.

5. In last column place a check mark when the package meets the requirements listed below. (Reference is made to 10CFR20, as amended.)

A. Each package has been suitably marked with the words, "CAUTION RADIOACTIVE MATERIALS" (Per. 20.203, 20.401, & 20.402).

B. Each package has been suitably marked to show the isotopes contained, the net quantity, and the date of measurement. (Per. 20.203, 20.401, & 20.402).

C. Each package has been entered and surveyed, with appropriate notations being made as to surface contamination, and the maximum radiation level at contact (two inches), and at one meter from the package surface. (Per. 20.401, (c).)

ITEM NO.	PHYSICAL STATE	RADIATION, MR/HR		PRINCIPAL ISOTOPE(S)	MILLCURIES BY-PRODUCT	DANGER (GROUP)	3. PREPARED (SOURCE)	CUBIC FEET	FINAL CHECK
		AT 2"	AT 1 METER						
#1	Solid	2.35	0.35	C ¹⁴ , H ³ , Z ⁶⁵	1.0, 30, 01	all IV	A/RVII	7.3	✓
				Na ²² , I ¹³¹	0.1, 0.01				
#2	Solid	0.35	0.05	H ³ , Na ²²	500, 100, 01	all IV	A/RVII	7.3	✓
				I ¹³¹ , C ¹⁴	0.1, 3.0	II, III			
#3	Solid	7.0	0.55	H ³ , C ¹⁴ , S ³⁵	3.0, 10, 01	all IV	A/RVII	7.3	✓
				Ca ⁴⁵ , Na ²²	0.1, 0.01				
#4	Solid	0.15	0	H ³ , C ¹⁴ , P ³²	100, 2.0, 0.01	all IV	A/RVII	7.3	✓
#5	Solid	5.0	1.0	C ¹⁴ , H ³ , I ¹³¹	5.0, 30, 01	all IV	A/RVII	7.3	✓
				I ¹³¹ , Na ²²	0.1, 0.2	III, IV			
#6	Solid	1.0	0.2	H ³ , C ¹⁴ , I ¹³¹	12.0, 5.0, 0.01	II, III, IV	A/RVII	7.3	✓
				Na ²²	0.2	IV			
#7	Solid	5.0	1.5	H ³ , C ¹⁴ , Na ²²	5.0, 3.0, 0.5	all IV	A/RVII	7.3	✓
				Na ²² , I ¹³¹ , I ¹²⁵	0.1, 0.01, 0.01	II, III, IV			
#8	Solid	0.0	0	H ³ , C ¹⁴	0.0, 0.0	II, III	A/RVII	7.3	✓
				I ¹²⁵ , Na ²²	100, 0.03	III, IV			
#9	Solid	7.0	0.55	I ¹³¹ , Na ²²	0.01, 0.5	III, IV	A/RVII	7.3	✓
				H ³ , C ¹⁴ , P ³²	3.0, 2.0, 0.01	all IV			
#10	Solid	3.0	1.0	S ³⁵ , S ³⁵ , Na ²²	0.01, 0.01, 0.2	all IV	A/RVII	7.3	✓
				C ¹⁴ , H ³ , S ³⁵	3.0, 2.0, 0.01	all IV			
#11	Solid	0.5	0	S ³⁵ , I ¹²⁵	0.01, 0.01	II, III	A/RVII	7.3	✓
				I ¹²⁵ (Natural)	0.01, 0.01	II, III	A/RVII		

B03877

ORIGINAL
TO NUCLEAR ENGINEERING CO., INC.

RADIOACTIVE SHIPMENT RECORD FORM

CONTINUATION SHEET

FROM UNIVERSITY OF MICHIGAN, RADIATION CONTROL SERVICE DATE July 9, 1969 196

1121 Catherine Street, Ann Arbor, Michigan 48104 PAGE two OF two

ITEM NO.	PHYSICAL STATE	RADIATION, MR/HR		PRINCIPAL ISOTOPE(S)	MILICURIES BY-PRODUCT	2. CONTAINER	3. POISONED SOURCE	CUBIC FEET	FINAL CHECK
		AT 2'	AT 1 METER						
#12	SOLID	60	6	Co-60	330.	III	B/RyIII	7.3	✓
				Sr-90	29.4	II			
				Fe-55	10.0	IV			
				Tm-170	0.4	III			

$29.4 \text{ mCi} = \text{desired activity}$

to 2500 sources found

1956-1969 (Source to 300 a
r 030)

excl - 2021

[Handwritten signature]

3/10

				Am-241	15	<u>I</u>		
				*C-14	0.1	<u>IV</u>		
#15	SOLID	115	10	Ag-110m	10	<u>III</u>	A/R ^{IV}	7.3 ✓
				Co-60	2	<u>III</u>		
				Zn-65	1 mCi	<u>IV</u>		
				Cs-137	.01	<u>III</u>		

ORIGINAL

803878

PIT NO. 28
ORIGINATOR NO. 152

15-55'S

DATE REC'D JUL 21 1969

CUBIC FEET SOLID	<u>110.25</u>
GALLONS LIQUID	<u>0.75</u>
CURIES SOLID	<u>0.75</u>
LIQUID	<u> </u>
TOTAL	<u> </u>
GRAMS SNM SOLID	<u> </u>
LIQUID	<u> </u>
TOTAL	<u> </u>
LBS SOURCE SOLID	<u>48.00</u>
LIQUID	<u> </u>
TOTAL	<u> </u>

BY [Signature]

RECEIVED
JUL 21 1969

8/12/69

803879

SEALED SOURCE LEAK TESTING for BETA and/or GAMMA - EMITTING BYPRODUCT MATERIAL

BUILDING	Mason Hall	METHOD OF TESTING	Wet smear - G.M. & scales
MATERIAL	Sp ⁹⁰	NOMINAL ACTIVITY	20 me as of 1956 ?
		CHEMICAL FORM	Sp ⁹⁰ sulphate (Blackwell)
SERIAL NUMBER	987	TYPE OF CONTAINER	thick walled glass-metal backing
		OWNERSHIP	Vision Research

DATE	REMARKS	LOCATION	DATE	REMARKS	LOCATION
3-28-57	No detectable activity	Bldg. # 6 W.R.			
1-20-58	No detectable activity	Bldg. # 6			
9-23-58	No detectable activity	Mason Hall			
Sent to Ohio State in care of Prof Blackwell					

SEALED SOURCE LEAK TESTING for BETA and/or GAMMA - EMITTING BYPRODUCT MATERIAL

BUILDING Willow Run METHOD of TESTING Wet smear - G.M. & scales

SOURCE MATERIAL Se⁹⁰ NOMINAL ACTIVITY 18 mc as of 1956? CHEMICAL FORM Se⁹⁰ sulphate IR Dept. Dr. Allen Becker Bldg 204

SERIAL NUMBER 13464 TYPE of CAPSULATION thick walled glass - metal braced OWNERSHIP Thick Lens Rm 1070 ent 281

DATE	REMARKS	LOCATION	DATE	REMARKS	LOCATION
4-10-57	No detectable activity	Bldg. # 41	6-26-64	$\approx 0.005 \mu\text{C}$ (No detectable)	Bldg 2216 ^{Mike} Lenio
5-7-58	No detectable activity	Bldg. # 41	12-17-64	$\approx 0.005 \text{ mc}$	Bldg 2216 ^{Mike} Lenio
11-3-58	No detectable activity	Bldg. # 41	6-27-65	$< 0.005 \mu\text{C}$	" "
5-21-59	No detectable activity	Bldg. # 41	12-3-65	$< 0.005 \mu\text{C}$ - $\frac{1}{2}$ detectable	Bldg 2216 ^{Mike} Lenio
11-17-59	No detectable activity	Bldg. # 41	6-30-66	$< 0.005 \mu\text{C}$ - $\frac{1}{2}$ detectable	Bldg 2216 "
Gordon has left, now belongs to D.B. Thompson, Bldg. 153		Bldg. 153	12-15-66	$< 0.005 \text{ mc}$	Bldg. 2216
3-21-60	Contact John Clute, Radar Lab.	Bldg. 153	6-8-67	$< 0.005 \mu\text{C}$	2216 ^{Willow} Run
3-21-60	No detectable activity	Bldg. 153	RCS 11-1-68 6-27-68 Exposure May 1969		
9-22-60	No detectable activity	Bldg. 153	12-20-67	$< 0.005 \mu\text{C}$	Bldg. 2041
6-21-61	No detectable activity	Bldg. 153	6-27-68	$< 0.005 \mu\text{Ci}$ no detectable	Bldg 2041
1-16-62	SEE Mr. Lenio, Mike No detectable activity	Bldg 2062-254	12-18-68	$< 0.005 \mu\text{Ci}$ no detectable	Rm 1070 Bldg 2041
6-27-62	Mr. Grant No detectable activity	Bldg 2041	6-10-69	$< 0.005 \mu\text{Ci}$ no detectable	ent 229 or 359 Bldg 2041
12-4-62	No detectable activity	Bldg. 2041	12-11-69	$< 0.005 \text{ uCi}$	R.C.S. Safe
8-30-63	SEE Mike & Lenio No detectable activity	Bldg 2102	5-22-70	$< 0.005 \text{ mc}$	R.C.S. Safe
12-23-63	No detectable activity	Bldg 2216 ^{Mike} Lenio	discontinued		

SEALED SOURCE LEAK TESTING for BETA and/or GAMMA - EMITTING BYPRODUCT MATERIAL

RADIATION CONTROL SERVICE METHOD OF TESTING
 SOURCE MATERIAL Se⁹⁰ NOMINAL ACTIVITY 18 mci as of 1963 CHEMICAL FORM Se⁹⁰ sulphate
 SERIAL NUMBER 13464 TYPE OF CAPSULATION thick walled glass-metal locked OWNERSHIP Solaris

DATE	REMARKS	LOCATION	DATE	REMARKS	LOCATION
	<u>White Source</u>		<u>3/21/78</u>	<u>Disposed of in barrel #67 sent to Atomic Disposal Co. for burial</u>	
<u>12-7-70</u>	<u><0.005 mci</u>	<u>R.C.S. SAFE</u>			
<u>6-17-71</u>	<u><0.005 mci</u>	<u>R.C.S.</u>			
<u>11-15-71</u>	<u><0.005 μci R</u>	<u>RCS - Safe</u>			
<u>5-4-72</u>	<u><0.005 μci R</u>	<u>RCS - Safe</u>			
<u>10-3-72</u>	<u><0.005 μci R</u>	<u>RCS - Safe</u>			
<u>4-10-73</u>	<u>700 cpm</u> <u><0.005 μci DP</u>	<u>RCS SAFE</u>			
<u>10/10/73</u>	<u>363</u> <u><0.005 μci R</u>	<u>RCS SAFE</u>			
<u>4/9/74</u>	<u>70 cpm</u> <u><0.005 μci DP</u>	<u>RCS SAFE</u>			
<u>10/14/74</u>	<u>25 cpm > BAC</u> <u><0.005 μci DP</u>	<u>RCS SAFE</u>			
<u>4-17-75</u>	<u><0.005 μci DP</u>	<u>RCS SAFE - 1112 NUB</u>			
<u>10-17-75</u>	<u><0.005 μci DP</u> <u>233 cpm</u>	<u>1112 NUB</u>			
<u>4/3-76</u>	<u><0.005 μci DP</u>	<u>1112 NUB</u>			
<u>10/21/76</u>	<u><0.005 μci DP</u>	<u>" "</u>			
<u>4/4/77</u>	<u>20 cpm > BAC</u> <u><0.005 μci DP</u>	<u>" "</u>			
<u>10/24/77</u>	<u><0.005 μci DP</u>	<u>" "</u>			

1978

RADIOISOTOPE SERVICE

INDICATIVE NAME

Liquid/Solid

INDICATIVE NAME	NAME	ISOTOPE	DATE COLLECTED	L/S	VOLUME	SAMPLE #	DATE PACKED	
6741 Med Sci	Claplin	^{125}I	3-15-78	S	40	194	3-14-78	65
2056 Nat Sci	Klein Smith	^{32}P , ^{35}S	3-15-78	S	11	195	3-17-78	65
4216 Dental	Diach	$^{3\text{H}}$, ^{14}C	3-16-78	S	22	196	3-17-78	65
5522 U. Hospital	Corey	^{125}I , ^{131}I , ^{111}In , ^{133}Xe , ^{67}Ga , ^{90}Y	3-17-78	S	21	197	3-20-78	66
5522 U. Hospital	Corey	^{125}I , ^{131}I , ^{111}In , ^{133}Xe , ^{67}Ga , ^{90}Y	3-17-78	S	20	198	3-20-78	66
4204 Dental	Lopatin	$^{3\text{H}}$	3-17-78	S	26	199	3-20-78	66
5323 Med Sci	Rittenhouse	^{125}I , ^{14}C , ^{35}S	3-17-78	S	25	200	3-20-78	66
2242 Med Sci	Midgley	^{125}I , ^{32}P	3-10-78	L	20	212	3-21-78	67
3232 Med Sci	England	^{125}I	3-16-78	L	20	222	3-21-78	67
5323 Med Sci	Rittenhouse	^{125}I	3-17-78	L	10	227	3-21-78	67
5323 Med Sci	Rittenhouse	^{125}I , ^{14}C	3-17-78	L	10	228	3-21-78	67
5323 Med Sci	Rittenhouse	^{125}I	3-17-78	L	10	229	3-21-78	67
2242 Med Sci	Midgley	^{125}I	3-20-78	L	20	234	3-21-78	67
4412 Med Sci	Kelley	^{125}I , $^{3\text{H}}$, ^{14}C	3-21-78	L	8	239	3-21-78	67
4412 Med Sci	Kelley	^{125}I , $^{3\text{H}}$, ^{14}C	3-21-78	L	8	240	3-21-78	67
4412 Med Sci	Kelley	^{125}I , $^{3\text{H}}$, ^{14}C	3-21-78	L	8	241	3-21-78	67
1112 N.U.B. (Safe)	—	^{90}Sr #13464 source	3-14-78	S	—	C-17	3-21-78	67
1112 N.U.B. (Safe)	—	natural U-238	3-14-78	S	—	C-18	3-21-78	67
1112 N.U.B. (Safe)	—	^{90}Sr #378 20mci	3-14-78	S	—	C-19	3-21-78	67
1112 N.U.B. (Safe)	—	^{137}Cs 1mci	3-14-78	S	—	C-20	3-21-78	67
1112 N.U.B. (Safe)	—	natural U-238	3-14-78	S	—	C-21	3-21-78	67

1978

DISPOSITION OF RADIOACTIVE WASTE

Liquid/Solid

ROOM # BUILDING	NAME	ISOTOPES	DATE COLLECTED	L/S	VOL/WT	BOTTLE # BARREL #	DATE PACKED	D-UM
1120 W. Hospital	Menen	^{125}I	3-21-78	S	47	206	3-22-78	67
4734 Med Sci	Davenport	^{125}I , ^{131}I	3-17-78	S	14	201	3-22-78	68
3232 Med Sci	England	^{125}I , ^3H	3-20-78	S	48	202	3-22-78	68
123 Neuroscience	Ryanoff	^{32}P , ^3H , ^{14}C	3-21-78	S	39	204	3-22-78	68
4727 Med Sci	Mahier	^{125}I , ^3H	3-21-78	S	33	205	3-22-78	68
Ashes from Incin	at N. Campus	^{85}Sr , ^{46}Ca , ^{141}Ce , ^{51}Cr	—	S	400	—	—	69
2242 Med Sci	Midgley	^{125}I	3-21-78	S	31	207	3-22-78	69
4713 Med Sci	Jacques	^{14}C , ^3H	3-22-78	S	12	209	3-22-78	69
Animals	—	^{125}I , ^{85}Sr , ^{46}Ca	—	S	250	—	3-28-78	70
Animals	—	^{125}I , ^{131}I	—	S	250	—	3-28-78	71
Animals	—	^{125}I , ^{67}Ga , ^{85}Sr , ^{46}Ca	—	S	250	—	3-28-78	72
Animals	—	^{125}I	—	S	250	—	3-28-78	73
Animals	—	^{125}I	—	S	250	—	3-28-78	74
Animals	—	^{125}I	—	S	250	—	3-28-78	75
Animals	—	^{125}I	—	S	250	—	3-28-78	76
Animals	—	^{125}I	—	S	250	—	3-28-78	77
Animals	—	^{125}I	—	S	250	—	3-28-78	78
Animals	—	^{125}I	—	S	250	—	3-28-78	79
Animals	—	^{125}I	—	S	250	—	3-28-78	80
Animals	—	^{125}I , ^{67}Ga	—	S	250	—	3-28-78	81
Animals	—	^{125}I , ^{85}Sr , ^{46}Ca	—	S	250	—	3-28-78	82

SHIPMENT #3 TUESDAY MARCH 28, 1978 36 drums (5 ^{rumors} 13 animals) 11 Vial drums

ATOMIC DISPOSAL CO., INC.

10926

6 GARDEN • FINLEY PARK ILLINOIS 60177 • 312/429-1660

U.S. NRC LICENSE NO. 11-0004-01

ILL. LICENSE NO. 11-0004-01

DATE: 3/28/78

RADIOACTIVE SHIPMENT RECORD

ATOMIC DISPOSAL CO., INC.

CUSTOMER: ILLINOIS RADIATION CONTROL SERVICE

NAME: _____ Page 1 of 2 Pages

ADDRESS: 1001 MILLER BLVD ANN ARBOR MI 48105

CUSTOMER ORDER NO. _____

MATERIAL DESCRIPTION: DRY RADIOACTIVE WASTE

CONTAINER DESCRIPTION: 55 GALLON STEEL DRUM

Container Size (Cu. Ft.)	Estimated Weight (Lbs.)	Physical State (Solid, Liquid, Gas)	CHEMICAL FORM	PRINCIPAL RADIOACTIVE ISOTOPES	Index	By Product (with carrier)	Source (LBS. Grams)	SNM	LABEL USED	MAXIMUM EXPOSURE RATE (mR/hr. at 1 ft.)	NS Signifi- cant con- tamination (✓)
4.5	140	X	DRY WASTE	^{137}Cs	100	5	---	---	RADIOACTIVE WHITE ONE BKGD	100	✓
	215			^{137}Cs	5	5	---	---			
	210			^{137}Cs	5	5	---	---			
	380			^{137}Cs	15	15	---	---			
	205			^{137}Cs	5	5	---	---			
	220			^{137}Cs	5	5	---	---			
	200			^{137}Cs	95	20	---	---	RADIOACTIVE YELLOW TWO	20	95
	205			^{137}Cs	5	5	---	---	RADIOACTIVE WHITE ONE BKGD	BKGD	BKGD
	170			^{137}Cs	5	5	---	---			
	510			^{137}Cs	15	15	---	---			
	130			^{137}Cs	15	15	---	---			
	400			^{137}Cs	15	15	---	---			
	150			^{137}Cs	15	15	---	---			
	195			^{137}Cs	5	5	---	---	No LABEL Required	BKGD	BKGD
	310			^{137}Cs	5	5	---	---	RADIOACTIVE WHITE ONE BKGD	BKGD	BKGD
	260			^{137}Cs	20	20	---	---	RADIOACTIVE YELLOW TWO	49	103
	190			^{137}Cs	5	5	---	---	RADIOACTIVE WHITE ONE BKGD	BKGD	BKGD
	400			^{137}Cs	15	15	---	---			

IS TO CERTIFY THAT THE ABOVE ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELED, AND IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE DEPARTMENT OF TRANSPORTATION.

ATOMIC DISPOSAL AGENT

Signature: [Signature]

Date: 3-28-78 Time: 11:00

[Signature]

Customer Signature

1/3/78

Date

CUSTOMER COPY

RAIDING THE DEPTHS OF THE OCEAN

DATE: 3-10-68

CUSTOMER CARE & TECHNICAL SUPPORT SERVICE

ADDRESS 1000 N. 10th St. - Apt. 101 - N. Miami Beach, Fla. 33162

MATERIAL DESCRIPTION: 12.5 INCHES DIA. (31.75 CM) X 1.5 INCHES THICK (3.81 CM) X 1.5 INCHES THICK (3.81 CM)

[illegible]

IS TO CERTIFY THAT THE ABOVE ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELED, AND IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS GOVERNING INTERNATIONAL TRANSPORTATION.

ATOMIC DISPOSAL AGENT

Signature

Dates

丁巳

CUSTOMER COPY

Ann Arbor, Mich.

Pg 210

View of Michigan

1965

Q.B.C. 21-215-4

1 6-11-65 10" R 590 X $\frac{1}{4}$ " Active by $\frac{1}{4}$ " OD

2 R1069726

3 A-61243

4

5 1966

6 2-28-66 1 24 456-2 1" OD X $\frac{1}{4}$ " SA Acc. $\frac{1}{4}$ " Thick

7 R1069767

WREG 55612

8 6-21-66

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HINGED FLAT OPENING

RAG LEDGER

GOLD SMITH BROS., Stationers & Printers, 77 Nassau St., N. Y. 8, CO 77900
JAN 70-3

625

MC

P12

MC

001607

SEALED SOURCE LEAK TESTING for ALPHA - EMITTING BYPRODUCT MATERIAL

BUILDING Fluids Laboratory METHOD OF TESTING Wipe lightly with cleansing tissue measure with PAC-36
 SOURCE MATERIAL Po 210 NOMINAL ACTIVITY 312 MC as of 2-28-66 CHEMICAL FORM Portable & Counter
Plated Source 5000 mc / sq inch
 SERIAL NUMBER TYPE OF CAPSULATION OWNERSHIP Dr Bach

DATE	REMARKS	LOCATION	DATE	REMARKS	LOCATION
3/11/66	Less than 0.005 mc Removeable	Fluids 2250	12-30-69	<0.005 mci (No Detectable)	
5/4/66	< .005 mc Removeable	"	6-23-70	Source less than .1 mci, Source considered decayed beyond need for further measuring.	
7/23/66	< 0.005 mc - No detectable	Fluids 2250			
1-25-67	< 0.005 mc - No detectable	FLUIDS 2250			
4-21-67	< 0.005 mc - No detectable	Fluids 2250		(Activity now ~ 39 mc.)	
6-22-67	< 0.005 mc - "				
9-20-67	< 0.005 mc - No detect				
12-18-67	< 0.005 mc - No detect				
3-11-68	< 0.005 mc - "				
6-24-68	< 0.005 mc - "				
9-16-68	< 0.005 mc - "				
12-6-68	< 0.005 mc - "				
8-20-69	< 0.005 mc - "	2250 Fluids			

Source in possession of ORN
 thru 6/23/70 or longer.
 No indication of ultimate disposal
 of physical source but Po 210 was
 held for decay while in ORN
 possession. Presumably some thing
 happened w/ 0.625 mci source. However
 no records found for that source either.

735 day ^{act}
 6.3 half lives

fer of new technology to the active water and waste water professionals in the mid-west area, he established a conference centered on the newest innovations in the field. This conference was first offered in 1950 and has been co-sponsored by the Civil and Environmental Engineering Department and the Michigan Department of Public Health ever since. It is conducted every two or three years. It is now named the Borchardt Conference and is held on the University of Michigan Campus. The 20th conference will be held in 2005.

The undergraduate option in Construction Engineering was adopted in 1948.

In 1949 the Structural Engineering Laboratory had a 400,000 pound capacity universal testing machine, a loading frame for testing large assemblies, deformer gages loading frames for testing models, electric strain gage equipment, and a well equipped shop for making models and test assemblies. These facilities allowed the testing of full-scale structural members and small scale models. The laboratory provided for class demonstrations, graduate study and research.

In 1949 the Michigan Chapter of Chi Epsilon was established with Professor Jack A. Borchardt as advisor.

In 1952 the Transportation Institute was established with Professor John C. Kohl as Director. The college announcement in 1953-54 lists the faculty and staff as of 1952 as follows: Earnest Boyce, Professor of Municipal and Sanitary Engineering, Chairman of Civil Engineering Department and Professor of Public Health Engineering in the School of Public Health; Robert H. Sherlock, Professor of Civil Engineering (Structures); Harry Bouchard, Professor of Geodesy and Surveying and Director of Camp Davis; Walter C. Sadler, Professor of Civil Engineering; Lawrence C. Maugh, Professor of Civil Engineering (Structures); William S. Housel, Professor of Civil Engineering (Soil Mechanics); Bruce G. Johnston, Professor of Structural Engineering; Ernest F. Brater, Professor of Hydraulic Engineering; Walter J. Emmons, Professor of Highway Engineering and Assistant Dean and Secretary of the College of Engineering; Glenn L. Alt, Associate Professor of Civil Engineering (Construction); Edward Young, Associate Professor of Geodesy and Surveying; John C. Kohl, Associate Professor of Civil Engineering (Transportation) and Director of the Transportation Institute; Leo M. Legatski, Associate Professor of Civil Engineering (Structures); Arnold J. McFarlan, Assistant Professor of Geodesy and Surveying; George M. Bleekman, Assistant Professor of Geodesy and Surveying; Jack A. Borchardt, Assistant Professor of Civil Engineering (Sanitary Engineering); Robert B. Harris, Assistant Professor of Civil Engineering (Construction); Frank E. Legg, Assistant Professor of Engineering Materials; Donald N. Cortright, Assistant Professor of Civil Engineering (Highway Engineering); Robert O. Goetz, Instructor in Civil Engineering (Soil Mechanics); Eugene A. Glysson, Instructor in Civil Engineering (Sanitary Engineering); Vlas D. Merkys, Resident Lecturer in Civil Engineering (Hydraulics); Wadi S. Rumman, Instructor in Civil Engineering (Structures).

In addition to the above were technicians George Geisendorfer in charge of the structures, hydraulics and sanitary laboratories, and Lorenzo Plumpton who was responsible for the geodetic and surveying equipment.

An indication of the number of Civil Engineering degrees granted over the years up to 1952 follows:

Bachelors Degrees in Civil Engineering

1857-79	1880-99	1900-19	1920-39	1940-52	Total
177	232	922	1,163	710	3,195

Graduate Degrees in Civil Engineering (believed to be low)

1857-79	1880-99	1900-19	1920-39	1940-52	Total
4	19	49	330	354	756

Source: "A Century of Engineering Education," U of M Press 1954, pg 1177.

In 1951-52 the College Announcement indicated there were 238 undergraduates in Civil Engineering.

In 1953 Professor Harry Bouchard died and Professor Bleekman assumed the Directorship of Camp Davis. Mr. Glenn O. Lease was appointed Instructor of Civil Engineering (Structures) and Professor E. Wendell Hanson was appointed Professor of Meteorology.

The program in Meteorology had been assigned to the Department of Civil Engineering to provide a location to present its course work and conduct its research until it could become established. Several other faculty members would be added in the next few years, namely, A. Nelson Dingle, Lecturer in Meteorology in 1954 and Gerald C. Gill, Lecturer in Civil Engineering (Meteorology) in 1956.

In 1958 the Meteorology area included Frank R. Bellaire, George W. Reynolds, Donald J. Portman, David L. Jones, and Floyd C. Elder. All were Lecturers in Meteorology at that time. The Meteorology group was transferred to the Engineering Mechanics Department in February 1961.

In 1953 Clinton L. Heimbach was appointed Assistant Professor of Railroad Engineering. In 1954 Ward K. Parr was made Associate Professor of Highway Engineering, and Ralph M. Berry, Professor of Geodesy and Surveying. The graduate program in Construction Engineering was established in 1954 by Professor Robert Harris.

In 1955 Victor L. Streeter was appointed Professor of Hydraulics, and in 1956 Glen V. Berg was appointed Lecturer in Civil Engineering (Structures). Berg would become Chairman of the Department in 1969.

The development on North Campus to eventually allow the movement of the College of Engineering to this location had proceeded in 1957 to the completion of the Automotive Laboratory which was to provide space for the Civil Engineering surveying classes and instrument room. The Mortimer Cooley Laboratory had been completed in 1955 along with the Phoenix Memorial Laboratory. This construction was followed by the completion of the Fluids Engineering Building in 1958 which provided laboratory facilities and space for all engineering departments with fluid dynamics interests. This provided the hydraulics laboratory for the Civil Engineering Department. The Fluids Laboratory would be later renamed the G. G. Brown Building.

SOURCES USED IN GODDARD SPACE FLIGHT CENTER PROJECT

THE UNIVERSITY OF MICHIGAN
SPACE PHYSICS RESEARCH LABORATORY
DEPARTMENT OF ELECTRICAL ENGINEERING



SPACE RESEARCH BUILDING
ANN ARBOR, MICHIGAN 48105
313-764-9460

March 13, 1968

Mr. N. L. Millis
Health Physicist
Phoenix Memorial Laboratory
North Campus

Dear Mr. Millis:

Enclosed are copies of our quick scan records for our AM-241 sources. Currently we have 5 sources, Nos. 10F, 1I, and 3 also 1g and 2g which we received March 6, 1968.

Sources 10F and 1I are mounted on our vacuum system, source 3 is stored in Room 1340B. Sources 1g and 2g are on schedule to be shipped to Ft. Churchill, Canada about April 5, 1968.

Sources 13A, 1a and 1f were shipped March 2, 1968 and are to be launched from Puerto Rico March 15, 1968. As was mentioned in our recent telephone conversation, we no longer have any tritium sources.

Also should our absolute filter from our hood exhaust be checked or replaced?

Sincerely,

A handwritten signature in cursive script that reads "P. O. Handy".

P. O. Handy
Associate Research Engineer

POH:jb

Enclosures

American Sources

1-C	2-C	3-P	4-P	5-P	6-P	7F	8F	9F	10 F	11 P
Received 1-6-65	Received 1-6-65	Received 8-17-65	Received 2-9-66	Received 2-9-66	Received 6-9-66	Received 5-26-66	Received 5-26-66	Received 5-26-66	Received 5-26-66	Received 10-28-66
.66 mc COP	1.1 mc COP	5 mc A8350 F 1.62 μ C.C.	5 mc A8350 F 4.07 μ C.C.	10 mc A16700 F 8.03 μ C.C.	5 mc A8350 F 1.62 μ C.C.	5 mc A8350 F 1.62 μ C.C.	5 mc A8350 F 1.62 μ C.C.	5 mc A8350 F 1.62 μ C.C.	5 mc A8350 F 1.62 μ C.C.	2.5 mc A8350 F 1.62 μ C.C.
8-15-66 1-17-66 1-29-66 Unk'd Areas II P26 CE	Unk'd Areas I F. 4. 66	Single Ser scrapped out 10-13-66	Double Ser. C. Collector scrapped out 10-13-66	Double Ser. C. Collector Sent back to USSR May 25, 66	Double Ser. C. Collector Sent back to USSR 10-26-66	Double Ser. #1 N.C. B-10-18	Double Ser. #2 N.C. B-15	Double Ser. C. Collector #3 N.C. B-17	Double Ser. C. Collector #4	C. Collector #1 Sent back to USSR May 27
									Sys. 5 1-13-67	

12P	✓ 1I	2I	3I	4A	5A	6A	7I	8I	9I	10I
Received 10-28-66	Received 11-29-66	Received 11-29-66	Received 11-29-66	Received 11-29-66	Received 11-29-66	Received 11-29-66	Received 12-9-66	Received 12-9-66	Received 12-9-66	Received 12-9-66
2.5 mc A8350 F 1.62 μ C.C.	2.5 mc A8350 F 1.62 μ C.C.	2.5 mc A8350 F 1.62 μ C.C.	2.5 mc A8350 F 1.62 μ C.C.	2.5 mc A8350 F 1.62 μ C.C.	2.5 mc A8350 F 1.62 μ C.C.	2.5 mc A8350 F 1.62 μ C.C.	2.5 mc A8350 F 1.62 μ C.C.	2.5 mc A8350 F 1.62 μ C.C.	2.5 mc A8350 F 1.62 μ C.C.	2.5 mc A8350 F 1.62 μ C.C.
C. Collector #2	C. Collector #1	C. Collector #2 C-23	C. Collector #3 C-22	Double Ser. #4 B-19	Double Ser. #5 C-21	C. Collector #6 B-19	C. Collector #1 B-20	C. Collector #2 C-21	C. Collector #3 C-24	Double Ser. #4 C-23

Americium Sources

11A	12A	✓ 13A	14A	1a	1b	1c	1d	1e	1f	2
Received 12-9-66	Received 12-9-66	Received 12-9-66	Received 12-9-66	Received 4-10-67	Received 4-10-67	Received 4-10-67	Received 4-10-67	Received 4-10-67	Received 4-10-67	Received 4-10-67
2.5 ml. A 8350 F 1.62 μ C.	2.5 ml. A 8350 F 1.62 μ C.	2.5 ml. A 8350 F 1.62 μ C.	2.5 ml. A 8350 F 1.62 μ C.	2.5 ml. A 8350 F 1.62 μ C.	2.5 ml. A 8350 F 1.62 μ C.	2.5 ml. A 8350 F 1.62 μ C.	2.5 ml. A 8350 F 1.62 μ C.	2.5 ml. A 8350 F 1.62 μ C.	2.5 ml. A 8350 F 1.62 μ C.	2.5 ml. A 8350 F 1.62 μ C.
Double Ser. #5 B-20	Double Ser. #6 C-24	Double Ser. #7 NC 8-16	Double Ser. #8 C-22	Double Ser. #1 NC-D29	Double Ser. #2 D-27 204	Double Ser. #3 D-28 203	Double Ser. #4 C-25	Double Ser. #5 C-25	Double Ser. #6 NC-C26 197	Double Ser. #7 D-27 202

X

2b	3	10	29
Received 4-10-67	Received 4-10-67	Received 3-6-68	Received 3-6-68
2.5 ml. A 8350 F 1.62 μ C.	2.5 ml. A 8350 F 1.62 μ C.	2.5 ml. A 8350 F 2.1 μ C.	2.5 ml. A 8350 F 2.1 μ C.
Double Ser. #6 D-28	Double Ser. #9	Double Ser. #1	Double Ser. #2

Americium-241 Radioactive Sources
Space Physics Research Laboratory

Robert D. Gandy
Sheet #1.

SPRL Source No.	* 1-C	* 2-C	3-P	4-P
USRC Source No.	# 1	# 2	—	# 1
Approx. Date Rec. & Nominal Activity	1-13-65 .66 mc	1-13-65 1.1 mc.	8-25-65 5 mc. with 1.62 μ Au Seal	2-9-66 5 mc. with 4.07 μ Au. Seal
Physical Construction	Foil Pieces Soft Soldered in Stainless Cup	Foil Pieces Soft Soldered in Stainless Cup	Foil Soft Soldered to feed thru Pins on Stainless Header.	Foil Soft Soldered to feed thru Pins on Stainless Header
USRC Leak Test Results	Solox Swab on Source 1-6-65 250 c/min.	Solox Swab on Source 1-6-65 300 c/min	Solox Swab on Source 7-23-65 900 c/min.	No information Sent by USRC
SPRL Leak Check Results	In vicinity of Source < 6 c/min.	In vicinity of Source < 6 c/min.	In vicinity of Source < 10 c/min.	In vicinity of Source < 6 c/min.
Environmental Testing	Vacuum Cycled Vibration Tested.		Vacuum Cycled	Vacuum Cycled
Leak Check Record	10-1-66 = 10 c/min.	10-1-66 = 10 c/min	10-1-66 < 6 c/min	10-1-66 < 6 c/min
Location & History	Flown on X-15 Oct - 66 Stored in RM 1024 SPRL 12-1-66 From Lab S - 67 Launch Feb 68 Arkas II	Stored in RM 1024 SPRL 12-1-66 Phoenix Lab Jan 67 T&E App. 67 1340 B 8-11-67 Launch Feb 68 Arkas I	Disposed of by RCS 10-13-66	Disposed of by RCS 10-13-66

Americium-241 Radioactive Sources
Space Physics Research Laboratory

SPRL Source No.	5-P	6-P	7 F	8F
USRC Source No.	# 2	—	# 1	# 2
Approx. Date Rec. & Nominal Activity	2-9-66 10 mc. with 8.03 μ Au Seal	6-16-66 5 mc. with 1.62 μ Au Seal	5-26-66 5 mc. with 1.62 μ Au Seal	5-26-66 5 mc. with 1.62 μ Au Seal
Physical Construction	Foil Soft Soldered to feedthru PINS ON Stainless Header	Foil Soft Soldered to feedthru PINS ON Stainless Header	Foil Soft Soldered to feedthru PINS ON Stainless Header.	Foil Soft Soldered to feedthru PINS ON Stainless Header
USRC Leak Test Results	No information sent by <u>USRC</u>	Solox Swab on Source 6-9-66 750 c/min.	Solox Swab on Source 5-23-66 4700 c/min.	Solox Swab on Source 5-23-66 1500 c/min.
SPRL Leak Check Results	None Taken.	In vicinity of Source 15 c/min.	In vicinity of Source 10 c/min.	In vicinity of Source < 6 c/min.
Environmental Testing	No Testing Performed.	Vacuum Cycled.	Vacuum Cycled Vibration Tested.	Vacuum Cycled Vibration tested.
Leak Check Record	None	10-19-66 20 c/min.	8-14-66 < 6 c/min.	7-10-66 < 6 c/min
Location & History	Sent back to USRC 5-25-66	Sent back to USRC 10-26-66	Installed in Nose Cone B-16-18 8-16-66 Launched from Wallops Isl.	Installed in Nose Cone B-15 7-12-66 Launched from Ft. Churchill

Sheet #2

Robert D. Hardy

Americium-241 Radioactive Sources
Space Physics Research Laboratory

At: P. A. Hardy
Sheet #3

SPRL Source No.	9F	⁸ 9F	11P	12P
USRC Source No.	#3	#4	#1	#2
Approx. Date Rec. & Nominal Activity	5-26-66 5mc. with 1.62 μ Au Seal	5-26-66 5mc. with 1.62 μ Au Seal	11-1-66 2.5 mc. with 1.62 μ Au Seal	11-1-66 2.5 mc. with 1.62 μ Au Seal
Physical Construction	Foil Soft Soldered to Feedthru Pins on Stainless Header	Foil Soft Soldered to Feedthru Pins on Stainless Header	Foil Soft Soldered to Feedthru Pins on Stainless Header	Foil Soft Soldered to Feedthru Pins on Stainless Header
USRC Leak Test Results	Solox Swab on Source 5-23-66 2300 c/min.	Solox Swab on Source 5-23-66 1500 c/min.	Solox Swab on Source 10-28-66 700 c/min.	Solox Swab on Source 10-28-66 350 c/min.
SPRL Leak Check Results	In vicinity of Source < 6 c/min.	In vicinity of Source 10 c/min.	In vicinity of Source < 6 c/min.	In vicinity of Source —
Environmental Testing	Vacuum Cycled Vibration Tested	Vacuum Cycled Vibration Tested.	Vacuum Cycled	
Leak Check Record	8-7-66 < 6 c/min.	8-14-66 < 6 c/min.	11-26-66 < 6 c/min.	6-20-67 = 50 c/min.
			6-20-67 70 c/min.	
Location & History	Installed in Nose Cone B-17 8-8-66 Launched from Wallops Isl.	Stored in Room 1024 SPRL 12-1-66 Sys. 5 #62 Phoenix T.E. Apr 67	Stored in Rm. 1024 SPRL 12-1-66 Phoenix T.E. Apr 67 Shipped to USRL Nov 67 (Source #1)	Stored in Rm 1024 SPRL 12-1-66 Phoenix T.E. Apr 67 Shipped to USRL Nov 67 (Source #2)

Americium-241 Radioactive Sources
Space Physics Research Laboratory

Sheet # 4

Patrick O. Hardy

SPRL Source No.	<i>* 1 I</i>	<i>2 I</i>	<i>3 I</i>	<i>4 A</i>
USRC Source No.	<i># 1</i>	<i># 2</i>	<i># 3</i>	<i># 4</i>
Approx. Date Rec. & Nominal Activity	<i>12-2-66 2.5 mc. with 1.62 μ Au Seal</i>	<i>12-2-66 2.5 mc. with 1.62 μ Au Seal</i>	<i>12-2-66 2.5 mc. with 1.62 μ Au Seal</i>	<i>12-2-66 2.5 mc. with 1.62 μ Au Seal</i>
Physical Construction	<i>Foil Soft Soldered to feedthru PINS on Stainless Header</i>	<i>Foil Soft Soldered to feedthru PINS on Stainless Header</i>	<i>Foil Soft Soldered to feedthru PINS on Stainless Header</i>	<i>Foil Soft Soldered to feedthru PINS on Stainless Header</i>
USRC Leak Test Results	<i>Solox Filter Paper on Source 11-29-66 50 c/min.</i>	<i>Solox Filter Paper on Source 11-29-66 < 20 c/min.</i>	<i>Solox Filter Paper on Source 11-29-66 < 20 c/min.</i>	<i>Solox Filter Paper on Source 11-29-66 < 20</i>
SPRL Leak Check Results	<i>In vicinity of source < 4 c/min</i>	<i>In vicinity of source < 4 c/min</i>	<i>In vicinity of source < 4 c/min</i>	<i>In vicinity of source < 4 c/min.</i>
Environmental Testing	<i>Vacuum Cycled Vibration Tested.</i>	<i>Vacuum Cycled Vibration Tested</i>	<i>Vacuum Cycled Vibration tested</i>	<i>Vacuum Cycled Temp. Cycled Vibration Tested</i>
Leak Check Record	<i>12-13-66 < 4 c/min</i>	<i>1-9-67 < 4 c/min.</i>	<i>12-24-66 < 4 c/min.</i>	<i>12-21-66 < 4 c/min.</i>
Location & History	<i>Stored in RM. 1024 SPRL 1-30-67 Sp 3 #66 Phos. TFF Apr. 67</i>	<i>Installed in Nose Cone C-23 1-9-67 Launched from Ft. Churchill, Can. 2-1-67</i>	<i>Installed in Nose Cone C-22 12-24-66 Launched from Ft. Churchill, Can. 2-1-67</i>	<i>Installed in Nose Cone B-19 12-21-66 Launched from Ft. Churchill 2-1-67</i>

Americium-241 Radioactive Sources
Space Physics Research Laboratory

Patrick A. Hendry
Sheet #5

SPRL Source No.	5A	6A	7I	8I
USRC Source No.	# 5	# 6	# 1	# 2
Approx. Date Rec. & Nominal Activity	12-2-66 2.5 mc. with 1.62 μ Au Seal	12-2-66 2.5 mc. with 1.62 μ Au Seal.	12-13-66 2.5 mc. with 1.62 μ Au Seal.	12-13-66 2.5 mc. with 1.62 μ Au Seal.
Physical Construction	Foil Soft Soldered to feedthru Pins on Stainless Header	Foil Soft Soldered to feedthru Pins on Stainless Header	Foil Soft Soldered to feedthru Pins on Stainless Header	Foil Soft Soldered to feedthru Pins on Stainless Header
USRC Leak Test Results	Solox Filter Paper on Source 11-29-66 150 c/min.	Solox Filter Paper on Source 11-29-66 100 c/min.	Solox Swab on Source 12-9-66 100 c/min.	Solox Swab on Source 12-9-66 50 c/min.
SPRL Leak Check Results	In vicinity of Source < 4 c/min.	In vicinity of Source < 4 c/min.	In vicinity of Source < 4 c/min.	In vicinity of Source < 4 c/min.
Environmental Testing	Vacuum Cycled Temp. Cycled Vibration Tested.	Vacuum Cycled Vibration Tested.	Vacuum Cycled Vibration Tested	Vacuum Cycled Vibration Tested.
Leak Check Record	1-4-67 < 4 c/min.	12-21-66 < 4 c/min.	12-31-66 < 4 c/min.	1-4-67 < 4 c/min.
Location & History	Installed in Nose Cone C-21 1-4-67 Launched from Ft. Churchill 2-1-67	Installed in Nose Cone B-19 12-21-66 Launched from Ft. Churchill 2-1-67	Installed in Nose Cone B-20 12-31-66 Launched from Ft. Churchill 2-1-67	Installed in Nose Cone C-21 1-4-67 Launched from Ft. Churchill 2-1-67

Americium-241 Radioactive Sources
Space Physics Research Laboratory

Patrick C. Blumley

Sheet #2

SPRL Source No.	9I	10I	11A	12A
USRC Source No.	# 3	# 4	# 5	# 6
Approx. Date Rec. & Nominal Activity	12-13-66 2.5 mc with 1.62 μ Au. Seal	12-13-66 2.5 mc. with 1.62 μ Au. Seal	12-13-66 2.5 mc. with 1.62 μ Au. Seal	12-13-66 2.5 mc. with 1.62 μ Au. Seal
Physical Construction	Foil Soft Soldered to feedthru Pins on Stainless Header	Foil Soft Soldered to feedthru Pins on Stainless Header	Foil Soft Soldered to feedthru Pins on Stainless Header	Foil Soft Soldered to feedthru Pins on Stainless Header
USRC Leak Test Results	Solox Swab on Source 12-9-66 < 20 c/min.	Solox Swab on Source 12-9-66 50 c/min.	Solox Swab on Source 12-9-66 150 c/min.	Solox Swab on Source 12-9-66 < 20 c/min.
SPRL Leak Check Results	In vicinity of Source < 4 c/min.	In vicinity of Source < 4 c/min.	In vicinity of Source < 4 c/min.	In vicinity of Source < 4 c/min.
Environmental Testing	Vacuum Cycled Vibration Tested	Vacuum Cycled Temp. Cycled Vibration Tested	Vacuum Cycled Temp. Cycled Vibration Tested	Vacuum Cycled Temp. Cycled Vibration Tested
Leak Check Record	1-11-67 < 4 c/min	1-9-67 < 4 c/min	12-31-66 < 4 c/min	1-11-67 < 4 c/min
Location & History	Installed in Nose Cone C-24 1-11-67 Launched from Ft. Churchill 2-1-67	Installed in Nose Cone C-23 1-9-67 Launched from Ft. Churchill 2-1-67	Installed in Nose Cone B-20 12-31-66 Launched from Ft. Churchill 2-1-67	Installed in Nose Cone C-24 1-11-67 Launched from Ft. Churchill 2-1-67

Americium-241 Radioactive Sources
Space Physics Research Laboratory

Peter D. Stanley
Sheet # 7

SPRL Source No.	13A	14A	1a	1b
USRC Source No.	# 7	# 8	# 1	# 2
Approx. Date Rec. & Nominal Activity	12-13-66 2.5 mc with 1.62 μ Au Seal	12-13-66 2.5 mc with 1.62 μ Au Seal	4-10-67 2.5 mc with 1.62 μ Au Seal.	4-10-67 2.5 mc with 1.62 μ Au Seal.
Physical Construction	Foil Soft Soldered to Feedthru Pins on Stainless Header	Foil Soft Soldered to Feedthru Pins on Stainless Header	Foil Soft Soldered to Feedthru Pins in stainless Header	Foil Soft Soldered to Feedthru Pins on Stainless Headers
USRC Leak Test Results	Solox Swab on Source 12-9-66 < 20 c/min.	Solox Swab on Source 12-9-66 < 20 c/min	Swab on Source 4-10-67 150 c/min	Swab on Source 4-10-67 400 c/min
SPRL Leak Check Results	In Vicinity of Source < 4 c/min	In Vicinity of Source < 4 c/min.	In vicinity of Source < 2 c/min	In vicinity of Source ~ 0
Environmental Testing	Vacuum Cycled Vibration Tested	Vacuum Cycled Temp. Cycled Vibration Tested.	Vacuum Cycled Vibration tested.	Vacuum Cycled Vibration tested.
Leak Check Record	1-24-67 < 4 c/min. 	12-24-66 < 4 c/min.	6-22-67 < 2 c/min	6-28-67 ~ 0
Location & History	Stored in Rm 1024 SPRL 1-30-67 Spec Trip #7 P.R. Launched from Puerto Rico 3-15-68 NC B-16	Installed in Nose Cone C-22 12-24-66 Launched from Ft. Churchill 2-1-67	X-15 Plane at Calif. 7-7-67 Launch from Puerto Rico 3-15-68 NC D-29	Launched 8-4-67 Nose Cone D-27 Pt Barrow Alaska

Americium-241 Radioactive Sources
Space Physics Research Laboratory

Frank A. Stenby
Sheet # 8.

SPRL Source No.	1c	1d	1e	1f
USRC Source No.	# 3	# 4	# 5	# 6.
Approx. Date Rec. & Nominal Activity	4-10-67 2.5 mc. with 1.62 μ Au Seal	4-10-67 2.5 mc. with 1.62 μ Au Seal.	4-10-67 2.5 mc. with 1.62 μ Au Seal	4-10-67 2.5 mc. with 1.62 μ Au Seal
Physical Construction	Foil Soft Soldered to Feedthru Pins on Stainless Header	Foil Soft Soldered to Feedthru Pins on Stainless Header	Foil Soft Soldered to Feedthru Pins on Stainless Header	Foil Soft Soldered to Feedthru Pins on Stainless Header.
USRC Leak Test Results	Swab on Source 4-10-67 1100 c/min.	Swab on Source 4-10-67 100 c/min.	Swab on Source 4-10-67 200 c/min.	Swab on Source 4-10-67 350 c/min.
SPRL Leak Check Results	In vicinity of Source 6 c/min	In vicinity of Source ~ 0	In vicinity of Source 1 c/min.	In vicinity of Source ~ 0
Environmental Testing	Vac. Cycled. Vibration tested.	Vac. Cycled Temp. Cycled Vib. Tested.	Vac. Cycled Vibration Tested.	Vac. Cycled Temp. Cycled Vib. Tested
Leak Check Record	6-28-67 14 c/min	7-19-67 ~ 0	7-19-67 ~ 0	7-24-67 2 c/min
Location & History	Launched 8-3-67 Nose Cone D-28 Pt Barrow, Ala.	Rm 1024 Nose Cone C-25 8-11-67	Rm 1024 Nose Cone C-25 8-11-67	Rm 1024 Nose Cone C-26 8-11-67
		Launched From Wallops Isl Sept. 67	Launched From Wallops Isl Sept 67	Launched From Puerto Rico 3-15-68 NC C-26

Americium-241 Radioactive Sources
Space Physics Research Laboratory

Richard D. Hendry
Sheet # 49.

SPRL Source No.	2a	2b	3	1g
USRC Source No.	# 7	# 8	# 9	# 1
Approx. Date Rec. & Nominal Activity	4-10-67 2.5 mc with 1.62 μ Au Seal	4-10-67 2.5 mc with 1.62 μ Au Seal	4-10-67 2.5 mc with 1.62 μ Au	3-5-68 2.5 mc with 2.12 μ Au O.C.
Physical Construction	Foil Soft Soldered to Feedthru Pins on S.S. Header	Foil Soft Soldered to Feedthru Pins on S.S. Header	Foil Soft Soldered to Feedthru Pins on S.S. Header	Foil Soft Soldered to Feedthru Pins on S.S. Header
USRC Leak Test Results	Swab on Source 4-10-67 400 c/min.	Swab on Source 4-10-67 200 c/min.	Swab on Source 4-10-67 200 c/min.	Filter Paper 3-6-68 300 c/min
SPRL Leak Check Results	In vicinity of Source < 2 c/min	In vicinity of Source ~ 3 c/min	In vicinity of Source < 2 c/min	In vicinity of Source < 4 c/min.
Environmental Testing	Vacuum Cyl. Vibration tested	Vac. Cycled. Vibration tested	Vac. Cycled Vibration tested.	
Leak Check Record	6-22-67 3 c/min	6-28-67 3 c/min	7-24-67 5 c/min.	3-11-68 4 c/min
Location & History	Launched 8-4-67 Nose Cone D-27 Pt. Barrow, Ala.	Launched. 8-3-67 Nose Cone D-28 Pt Barrow, Ala.	Rm 1024 Nose Cone C-26 8-11-67	
			Stored 3-11-68 RM 1340B	

Americium-241 Radioactive Sources
Space Physics Research Laboratory

SPRL Source No.	⑦ 29			
USRC Source No.	# 2			
Approx. Date Rec. & Nominal Activity	3-5-68 2.5 mc. with 2.12 μ Au			
Physical Construction	Foil Soft Soldered to feedthru Pins on S.S. Header			
USRC Leak Test Results	Filter Paper 3-6-68 <u>Bld.</u>			
SPRL Leak Check Results				
Environmental Testing				
Leak Check Record				
Location & History				

RADIOACTIVE SOURCE QUESTIONNAIRE

IDENTIFICATION & DESCRIPTION

1. Source Owner: **University of Michigan**
 2. Address: **2455 Hayward Ann Arbor, Michigan** Telephone No. **764-2460**
 3. AEC License No. **21-R15-4 (1867)** 4. Ident. No. on Source: **20-2**
 5. Manufacturer: **E. I. du Pont Corp.** 6. Address: **Diamondburg, Penn.**
 7. Isotope Content: **Plutonium** 8. Quantity (micrograms): **1500** As of
 9. Chemical Form: **Plutonium** 10. Physical State: **SAC** 11. Source is ☐ Sealed ☒ Unsealed

SOURCE USE DATA

12. GSFC Experiment No. (or Description): **Pitot-Static** Program No. **NAFES**
 13. Purpose of Source: ☐ External Calibration ☐ Inflight Calibration ☐ Power Supply ☒ Other
Ionization source for Air Density Sensor
 14. Locations where Source is to be Used and/or Stored and Approximate Dates:
 a. Location: **Fort Churchill** b. Dates: **July 20, 1966** To **August 10, 1966**
 To To To

TEST DATA

15. Date Source Last Tested: **N/A** 16. Results (Micrograms): **N/A**
 17. Thermo-Vacuum Qualified To: **20** mm Hg **20** °C; + **20** °C 18. Date: **10-2-66** 19. Location: **S.E.P.C.**
 20. Source Diagram (Include Details on Sealing, Techniques and Dimensions):

See Reference Copy
GSFC Source No. H-3-48
Date Assigned 1-24-66

SOURCE HISTORY

21. Source Custodian: **P.O. Hardy** 22. Telephone No. **764-2460**
 23. Source History:
 a. **John Harvath**
 b. **John Harvath**
 c. **John Harvath**
6-24-66 Custodian or Recd. Safety Officer: **Patrick O. Hardy**
 (Date) (Signature)

GSFC USE

24. GSFC No. **H-3-48** 25. Date Assigned: **1-24-66** 26. By: **C.R. Hamilton/RDC**
 27. Leak Test ☐ Required ☒ Not Required: 28. Date Returned to Owner:
 Source Accepted By:
 Source Released By:

Dist.

Radiological Office - White & Pink
 Custodian - Green
 Originator - Yellow
 Program Office - Blue

INDUCTIVE SOURCE QUESTIONS

Source Name: University of Michigan
 Address: Ann Arbor, Michigan Telephone No. 734-763-1000
 AEC Liaison: 1941 A. Blank Name or Title: 17-6
 Identification: CONF. B. Address: Ann Arbor, Mich.
 Reporting Category: 1 C. Reporting Organization: 1500000
 Chemical Form: 12 Physical State: 1 Source is: ☐ Civil ☐ Military

FORM 100-10 (Rev. 1-25-60) **First-Stage** **Page 1** **100-10**
 Proposed System ☒ General Collection ☐ Library Collection ☐ Special Series ☐ Other

Examinations when Storage is to be Used and/or Stored and Approved Dates:

To	From	To	From
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Date Rec'd _____ To _____
 From _____ Sent by _____
 Subject _____

See Reference Copy
OSPC Serial No. H-7-48
Date assigned 1-24-68

Source Continued: F.O. Hardy Telephone No. 766-2480
Source Name: Jack Harvath b. _____
Source Address: John Harvath d. _____
Date: 6-14-66 Coordinator or Rep. Society Officer: Patric O. Hardy
(Signature)

25. Date Assigned: 1-16-66 26. By: C. R. Hamilton / Pdt
 Look Test: ☐ Required ☒ Not Required 27. Stop Required to Grant: ☐ ☐
 Source Accepted For: _____
 Source Returned For: _____

Histological Stains - White & Pink

Originator - Yellow

~~SECRET~~

Program Office: Blue

● (3/50)

RADIOACTIVE SOURCE QUESTIONNAIRE

Source Owner: University of Michigan
 Address: 2445 Tappan Ann Arbor, Michigan Telephone No. 764-9460
 AEC License No. 25-218-9 (1957) A. Host: None
 Manufacturer: E. E. Moseley Corp. B. Address: Ann Arbor, Mich.
 Isotope: Am-241 C. Quantity: 1.500 g.
 Chemical Form: Am-241 D. Physical State: Solid E. Source is ☐ Sealed ☒ Unsealed

GSFC Equipment No. (for description): Pitot-Static Equipment No. 821200
 Purpose of Source: ☐ General Calibration ☐ Inflight Calibration ☐ Power Supply ☒ Other
Indication source for Air Density

Locations where Source is to be Used and/or Stored and Approximate Dates:
 a. Location: Fort Churchill b. Dates: July 20, 1966 To August 10, 1966
 To _____
 To _____

How Source Leak Tested: NA 14. Sample Room: NA
 When Vacuum Sealed: NA at 20 °C. NA °C. 15. Location: G.S.F.C.

Source Diagram (Sketch Details or Sketch, Techniques and Dimensions)
See Reference Copy
GSFC Source No. H-3-48
Date assigned 1-24-66

Source Custodian: P.O. Hardy 22. Telephone No. 764-9460
 Source Manager: John Norvath
 a. John Norvath b. _____
 c. _____ d. _____
6-14-68 Custodian or Rad. Safety Officer: Patrick O. Hardy
 (Date) (Signature)

GSFC No. H-3-58 25. Date Assigned: 6-16-66 26. of R. Hamilton/Rat
 Leak Test ☐ Required ☒ Not Required 28. Date Returned to Owner: _____
 Source Accepted By: _____
 Source Released By: _____

Biological Office - White & Pink
 Radiation - Green
 Originator - Yellow
 Program Office - Blue
 15/64

RADIOACTIVE SOURCE QUESTIONNAIRE

Source Owner: University of Michigan
 Address: 4400 TAPSCOTT AVE. ANN ARBOR, MICHIGAN 48106
 AEC License No. 10-21-50 (M-7) 4. Ident. Mark: None
 Manufacturer: W. A. RICHARDSON CO. INC. 5. Address: None
 Isotope: Am-241 6. Quantity: 1.0000 g
 Chemical Form: Am-241 10. Physical State: Solid 11. Source is: ☐ Sealed ☒ Unsealed

GAFC Equipment No. (or Description): Pitot-Static Instrument No.: None
 Power Source: ☐ Battery ☐ Mains ☐ Other: None

Locations where Source is to be Used and/or Stored and Approximate Dates:
 a. Location: Fort Churchill b. Date: July 26, 1966 To: August 10, 1966
 To: _____
 To: _____

Radioactive Source Type: Am-241 14. Radioactive Source: Am-241
 Temperature: Room Temp °C. 15. None °C. 16. None °C.
 Source Design: Am-241 or Am-241 or Am-241 or Am-241

See Reference Copy
 GAFC Source No. H-3-48
 Data assigned 1-24-66

Source Custodian: F.O. Hardy 22. Telephone No.: 734-5000
 Source User: W. A. RICHARDSON
 a. JOHN ROSE b. _____
 c. _____ d. _____
 6-14-66 C. B. Hamilton / R.R.
 (Date) (Signature)

GAFC No. H-3-59 25. Date Assigned: 7-18-66 26. Date Returned: None
 Leak Test: ☐ Required ☒ Not Required
 Source Accepted By: _____
 Source Released By: _____

Biological Office - White & Pink
 Radiation - Green
 Originator - Yellow
 Program Office - Blue

SPACE RESEARCH BLDG. - N. CAMPUS

INDEX OF AUTHORS

WIPE TEST - GAS FLOW PROPORTIONAL COUNTER

Am-241

Abstract

5 mc.

2-17-66

11-10-68
 11-10-68

Plated source

AM-241-156

TERM OF
PUBLICATION

CONCLUSIONS

Horvath (Handy)

DATE	DESCRIPTION	LOCATION	REMARKS	LOCATION
2-17-66	Source in shipping container unopened. Container < 0.005 μ c	RCS - B 13		
5-23-66	< 0.005 μ c See attached sheet	Space Res. Bldg.		
6-23-66	Source to GSFC (Goddard)			
	RCS 101 # 68057 Expires Nov 30, 1968			
	Leak test records maintained by N. Hillis			

RADIOACTIVE SOURCE QUESTIONNAIRE

IDENTIFICATION & DESCRIPTION

1. Source Owner: University of Michigan
2. Address: 2455 Bayward Ann Arbor, Michigan Telephone No. 764-9460
3. REC License No. 21-213-4 (MSV)
4. Ident. Nos. on Source: 8-1
5. Manufacturer: U.S. Radium Corp.
6. Address: Bloomington, Penn.
7. Isotopic Content: Am-241
8. Quantity (Millicuries): 5 As of _____
9. Chemical Form: Am-241
10. Physical State: Sec 2011 is ☐ Sealed ☒ Unsealed

SOURCE USE DATA

12. REC Experiment No. (or Description): Pitot-Static Program No. Metres
13. Purpose of Source: ☐ External Calibration ☐ Inflight Calibration ☐ Power Supply ☒ Other: Ionisation Source for Air Density Sensor
14. Locations where Source is to be Used and/or Stored and Approximate Dates:

a. Locations: <u>Port Churchill</u>	b. Dates: <u>July 20, 1966</u> To <u>August 10, 1966</u>
_____	To _____
_____	To _____

TEST DATA

15. Date Source Leak Tested: 8-23-66
16. Results (Microcuries): 1.4 x 10⁻³
17. Thermo-Vacuum Qualified To: _____ mm Hg - _____ °C; + _____ °C.
18. Date: _____
19. Location: _____

SOURCE DIAGRAM

20. Source Diagrams (Include Details on Sealing, Techniques and Dimensions):

See Reference copy for Am-241 source.

Am-241-155

SOURCE CUSTODY & USERS

21. Source Custodian: P.O. Handy
22. Telephone No. 764-9460

23. Source Users:

a. Jack Horvath

c. John Hooks

b. _____

d. _____

8-14-66

(Date)

Custodian or Rad. Safety Officer

Patrick O. Handy

(Signature)

REC USE

24. GSFC Use: Am-241-156
25. Date Assigned: 6/16/66
26. By: C. R. Hamilton / RDC
27. Leak Test: ☒ Required ☒ Not Required
28. Date Returned to Owner: _____
- Source Accepted By: _____
- Source Released By: _____

DISTR.

Radiological Office - White & Pink
Custodian - Green

Originator - Yellow
Program Office - Blue

—, —

METHOD OF TESTING

WIPE TEST - GAS FLOW PROPORTIONAL COUNTER

FORMER
ACTING

5 mc.

2-17-66

CHEMICAL
FORM

plated source

Am-241-155

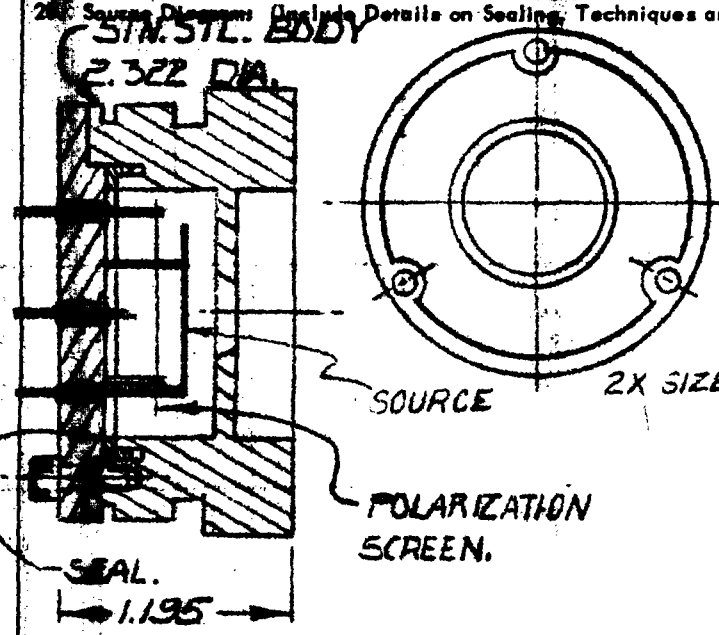
DISCUSSION

07552101

Horvath (Handy)

[illegible]

RADIOACTIVE SOURCE QUESTIONNAIRE

IDENTIFICATION & DESCRIPTION	1. Source Owner: <u>University of Michigan</u>		4. Ident. No. on Source: <u>7-2</u>	
	2. Address: <u>2455 Hayward Ann Arbor, Michigan</u>		Telephone No. <u>764-9460</u>	
SOURCE USE DATA	3. AEC License No. <u>21-215-4 (B57)</u>		5. Manufacturer: <u>U.S. Radium Corp.</u>	
	6. Address: <u>Bloomington, Penn.</u>		8. Quantity (MilliCurie): <u>5</u> As of: <u>SEC 20</u>	
	7. Isotopic Content: <u>Am-241</u>		10. Physical State: <input type="checkbox"/> Sealed <input checked="" type="checkbox"/> Unsealed	
	9. Chemical Form: <u>Am-241</u>			
	11. GSFC Experiment No. (or Description): <u>Pitot-Static</u>		12. Purpose of Source: <input type="checkbox"/> External Calibration <input type="checkbox"/> Inflight Calibration <input type="checkbox"/> Power Supply <input checked="" type="checkbox"/> Other	
	13. Location where Source is to be Used and/or Stored and Approximate Dates:			
TEST DATA	14. Date Source Leak Tested: <u>6-23-66</u>		15. Result (Microcuries): <u>4.2×10^{-8}</u>	
	16. Thermo-Vacuum Qualified To: <u>mm Hg</u> <u>°C</u> <u>+</u> <u>°C</u>		17. Date: <u>July 20, 1966</u> To <u>August 18, 1966</u>	
SOURCE DIAGRAM	20. Source Diagram (Include Details on Sealing Techniques and Dimensions):			
				
SOURCE CUSTODY & USERS	21. Source Custodian: <u>P.O. Handy</u>		22. Telephone No. <u>764-9460</u>	
	23. Source Users: <u>Jack Horvath</u> <u>John Books</u>			
GSFC USE	24. GSFC No. <u>Am-241-155</u>		25. Date Assigned: <u>6/16/66</u>	
	26. By: <u>C. R. Hamilton / HLR</u>		27. Date Returned to Owner: <u>6-14-66</u>	
DIST.	28. Date Assigned: <u>6-14-66</u>		29. Date Returned to Owner: <u>6-14-66</u>	
	30. Date Assigned: <u>6-14-66</u>		31. Date Returned to Owner: <u>6-14-66</u>	
32. Date Assigned: <u>6-14-66</u>		33. Date Returned to Owner: <u>6-14-66</u>		
34. Date Assigned: <u>6-14-66</u>		35. Date Returned to Owner: <u>6-14-66</u>		
36. Date Assigned: <u>6-14-66</u>		37. Date Returned to Owner: <u>6-14-66</u>		
38. Date Assigned: <u>6-14-66</u>		39. Date Returned to Owner: <u>6-14-66</u>		
40. Date Assigned: <u>6-14-66</u>		41. Date Returned to Owner: <u>6-14-66</u>		
42. Date Assigned: <u>6-14-66</u>		43. Date Returned to Owner: <u>6-14-66</u>		
44. Date Assigned: <u>6-14-66</u>		45. Date Returned to Owner: <u>6-14-66</u>		
46. Date Assigned: <u>6-14-66</u>		47. Date Returned to Owner: <u>6-14-66</u>		
48. Date Assigned: <u>6-14-66</u>		49. Date Returned to Owner: <u>6-14-66</u>		
50. Date Assigned: <u>6-14-66</u>		51. Date Returned to Owner: <u>6-14-66</u>		
52. Date Assigned: <u>6-14-66</u>		53. Date Returned to Owner: <u>6-14-66</u>		
54. Date Assigned: <u>6-14-66</u>		55. Date Returned to Owner: <u>6-14-66</u>		
56. Date Assigned: <u>6-14-66</u>		57. Date Returned to Owner: <u>6-14-66</u>		
58. Date Assigned: <u>6-14-66</u>		59. Date Returned to Owner: <u>6-14-66</u>		
60. Date Assigned: <u>6-14-66</u>		61. Date Returned to Owner: <u>6-14-66</u>		
62. Date Assigned: <u>6-14-66</u>		63. Date Returned to Owner: <u>6-14-66</u>		
64. Date Assigned: <u>6-14-66</u>		65. Date Returned to Owner: <u>6-14-66</u>		
66. Date Assigned: <u>6-14-66</u>		67. Date Returned to Owner: <u>6-14-66</u>		
68. Date Assigned: <u>6-14-66</u>		69. Date Returned to Owner: <u>6-14-66</u>		
70. Date Assigned: <u>6-14-66</u>		71. Date Returned to Owner: <u>6-14-66</u>		
72. Date Assigned: <u>6-14-66</u>		73. Date Returned to Owner: <u>6-14-66</u>		
74. Date Assigned: <u>6-14-66</u>		75. Date Returned to Owner: <u>6-14-66</u>		
76. Date Assigned: <u>6-14-66</u>		77. Date Returned to Owner: <u>6-14-66</u>		
78. Date Assigned: <u>6-14-66</u>		79. Date Returned to Owner: <u>6-14-66</u>		
80. Date Assigned: <u>6-14-66</u>		81. Date Returned to Owner: <u>6-14-66</u>		
82. Date Assigned: <u>6-14-66</u>		83. Date Returned to Owner: <u>6-14-66</u>		
84. Date Assigned: <u>6-14-66</u>		85. Date Returned to Owner: <u>6-14-66</u>		
86. Date Assigned: <u>6-14-66</u>		87. Date Returned to Owner: <u>6-14-66</u>		
88. Date Assigned: <u>6-14-66</u>		89. Date Returned to Owner: <u>6-14-66</u>		
90. Date Assigned: <u>6-14-66</u>		91. Date Returned to Owner: <u>6-14-66</u>		
92. Date Assigned: <u>6-14-66</u>		93. Date Returned to Owner: <u>6-14-66</u>		
94. Date Assigned: <u>6-14-66</u>		95. Date Returned to Owner: <u>6-14-66</u>		
96. Date Assigned: <u>6-14-66</u>		97. Date Returned to Owner: <u>6-14-66</u>		
98. Date Assigned: <u>6-14-66</u>		99. Date Returned to Owner: <u>6-14-66</u>		
100. Date Assigned: <u>6-14-66</u>		101. Date Returned to Owner: <u>6-14-66</u>		

UNITED STATES RADIUM CORPORATION

BLOOMSBURG DIVISION

4150 OLD BEEWICK ROAD
BLOOMSBURG, PENNSYLVANIA 17815

Telephone Bloomsburg, Pa. 784-3510 Area Code 717

TWX: Bloomsburg
717-784-2447

JUN 8 1968

Data Sheet

Date: 6-6-68

Customer University of Michigan PO# B-89843 SO# ML066847
C/O R. Handy
Radiation Control Serv. No. Pcs. 5
1121 Catherine St. Activity Content 5mc each
Ann Arbor, Michigan 48105

USRC or Cust. Dwg. # B-005-222 Chemical Form Americium 241

Dimensions: _____

Grade: _____ Backing: 0.010" OFHC ☐ 0.002" St. Steel ☐
Other ☐ _____

CONTAMINATION SURVEY

Type of measurement made: Filter Paper ☒ _____

Method of Leak Testing: Filter Paper (____) Swab (____) Immersion (____)

Alpha ☒ Beta _____ Gamma _____

Solvent used: H₂O (____) MEK (____) Solox (☒)

Instrument used:

Internal _____ PCC10A, 1620A CRM

External _____ G-M Tube 1620A CRM

GM tube window thickness _____ 1.4 mg/cm²

FIRST LEAK TEST _____ FINAL LEAK TEST 6-6-68

RADIATION SURVEY

Type of measurement made:

Alpha (____); Beta (____); Gamma (____); Neutron (____)

Measurement from center of chamber: (____in.); (____Meter)

Instrument used: Beckman MX4 (____) Neutron (____)

End Fire _____ POC Internal (____) POC External (____)

Radial Fire _____ 2586 Nuclear Chicago (____)

Other _____

LIGHT MEASUREMENT

Type of measurement made:

Brightness (____) Decay (____) Calibration (____)

Instrument used: USRC Photometer (____)

Other _____

Measurement readings on other side
jc

[illegible]

- ☒ We hereby certify that the parts and/or material furnished on your above captioned order have been leak tested as required under our Atomic Energy Commission License governing sealed sources and that the results of this test showed the parts and/or material to be sealed and permissible for transfer.
- ☐ We hereby certify that the parts and/or material furnished on your above captioned order have been leak tested.

- ☐ Atomic Energy Commission regulations permit a maximum removable contamination level of 0.005 microcuries. The results of our measurements on the (swab) (filter paper) from your source(s) indicate that the removable contamination level (is) (is not) within the allowable limits.

Signed:

Frank Buck

UNITED STATES RADIUM CORPORATION

Agent F. Buck

Title Mr. Radioactive Prods.

Date 6-6-68

SEALER SOURCE LEAD TESTING FOR ALPHA EMITTING DEPRODUCT MATERIAL

SPACE PHYSICS RES. BLDG.--N. CAMPUS LEAD TESTING WIPE TEST - PROPORTIONAL COUNTER

Am-241 NOMINAL 5 mc. 6/9/66 CHEMICAL FORM Americium-241

CALCULATION

PLATED SOURCE

OWNERSHIP

HORVATH - HANDY

DATE

LOCATION

DATE

REMARKS

LOCATION

6/9/66

See attached form

UNITED STATES RADIUM CORPORATION

BLOOMSBURG DIVISION

4150 OLD BERWICK ROAD
BLOOMSBURG, PENNSYLVANIA 17815

Telephone Bloomsburg, Pa. 784-3510 Area Code 717

TWX: Bloomsburg
717-784-2447Data Sheet of Radiosotope Sealed SourcesDate: 6-9-66

Customer The University of Michigan PO# R-59049 SO# BI064021
Radiation Control Service
1121 Catherine St. No. Pcs. 1
C/O Mr. P.O. Handy
Ann Arbor, Michigan 48105 Activity Content 5 mc
USRC or Cust. Dwg. # _____ Chemical Form Americium 241

CONTAMINATION SURVEY

Type of measurement desired: (check)

Method of Leak Testing:

Swab (☒ **solox**) Immersion (____)

Solvent used:

H₂O (____) MEK (____)

Instrument used:

Internal ☒ PCC10A, 1620 CRMNuclear Chicago (____) Baird Atomic (____)
(#1620A, 1615B) (#410)

External _____ G-M Tube, 1620 CRM

GM tube window thickness _____ 1.4 mg/cm²FIRST LEAK TEST 6/1/66FINAL LEAK TEST 6/3/66

Six month leak test to be performed by Cust. or returned to USRC.

RADIATION SURVEY

Type of measurement desired: (check)

Alpha (____); Beta (____); Gamma (____); Neutron (____)

Measurement from center of chamber:

(____ in.); (____ Meter)

Instrument used:

Beckman MX4 (____) Neutron (____)

End Fire _____

PCC Internal (____) PCC External (____)

Radial Fire _____

2586 Nuclear Chicago (____)

Other _____

LIGHT MEASUREMENT

Type of measurement desired: (check)

Brightness (____)

Decay (____)

Instrument used:

USRC Photometer (____)

Other _____

Measurement readings on other side

MISCELLANEOUS SOURCES



VETERANS ADMINISTRATION
CENTER
WILSHIRE AND SAWTELLE BOULEVARDS
LOS ANGELES, CALIFORNIA 90073
November 8, 1971

NOV 15 1971

YOUR FILE REFERENCE:


IN REPLY REFER TO:

Mr. Arthur J. Solari
Radiological Safety Officer
The University of Michigan
Radiation Control Service
1121 Catherine Street
Ann Arbor, Michigan 48104

Dear Mr. Solari:

I brought the radium static eliminator with me to VA Wadsworth
Hospital.

Sincerely,


WALLACE W. TOURTELLOTTÉ, M.D., Ph.D.
Chief of the Neurology Service
Wadsworth General Hospital

Professor and Vice-Chairman
Department of Neurology, UCLA

:dg

cc Mrs. Susan Gillis

Include Zip Code in your return address and give veteran's social security number.
Show veteran's full name and VA file number on all correspondence. If VA number is unknown, show service number.

Radiations

data sheet 20.50

radium and radioisotope-activated foil

Radioactive foil fabrication processes have been intensively developed by our laboratories, during the past decade, for the production of radium activated static eliminating units. These foils, incorporating radioactive elements or their salts as an integral part of the foil structure, provide a highly versatile means of applying radioactive emission in accord with widely varying requirements. Radioisotopes which have been used as active agents in the foil include, in addition to radium: the strontium 90 - yttrium 90 system with its high energy beta emission, thallium 204 emitting low energy beta rays, cobalt 60 offering high energy gamma emission, and polonium 210 and radium D as a source of alpha particles. Other isotopes may offer specific characteristics which would make their availability in this form interesting for particular applications.

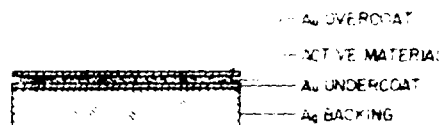
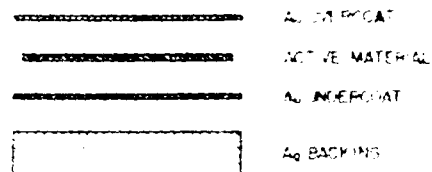
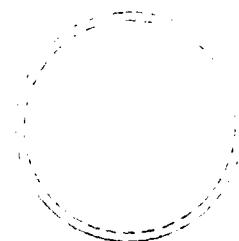
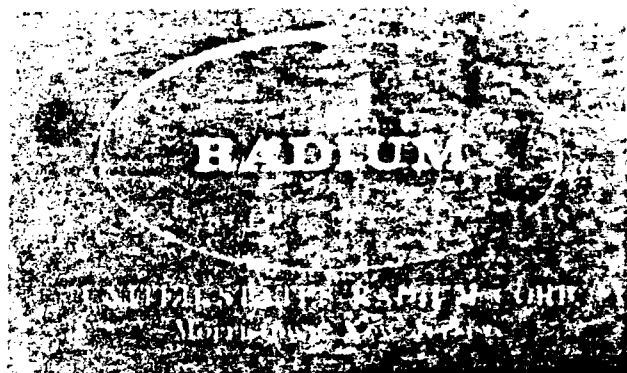
fabrication

The standard type foil consists essentially of gold and silver layers welded and rolled into a thin ribbon. The radioactive agent is incorporated into the active layer of the ribbon by means of powder metallurgical techniques, and is not the plated or evaporated radioactive deposit which is frequently encountered in various sources of radioactive emission.

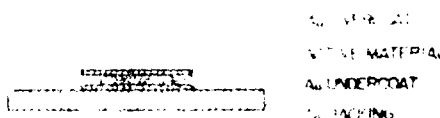
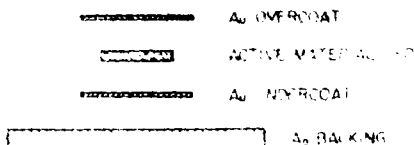
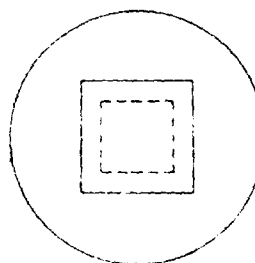
Standard radium-containing foil is supplied in any concentration up to approximately 1250 micrograms per square inch. In isotope-containing foils, radioactive material can be supplied in concentrations from a fraction of a microcurie per square inch up to hundreds of millicuries per square inch, within limits governed by the type of emitted radiation and the specific activity of the radioactive agent being used. An extremely high degree of uniformity of distribution of radioactive material throughout the active area is observed at all concentrations.

selective emission

Filtration of radiation in varying degrees as required in specific applications can be effected by overlaying of pre-determined thicknesses of metal as the foil surface layer during fabrication. For efficient transmission of alpha or low energy beta particles, filtration thicknesses of a fraction of a milligram per square centimeter are available. On the other hand, reduction of particle range or elimination of undesirable radiation components can be



LAB-276: Sealed beta source, with extensive active surface. Specific activity may be varied to meet specification.



LAB-277: Sealed beta source, with extensive active surface. All dimensions given are approximate.

Radioactive foil can be supplied in overall thickness to meet specifications in the range from a lower limit of a few microns to an upper limit of several thousandths of an inch. Since the foil is easily punched, secured and formed, and can be welded or connected, great latitude is permitted in design and type of backing which might be desirable. Foils are available in active area to meet specifications, continuous ribbons being currently supplied up to a maximum width of four inches and a maximum length of 72 inches. Inactive border areas are supplied if desired, and high resistance to oxidation and corrosion is achieved through finish plating of the foil with palladium or rhodium.

applications

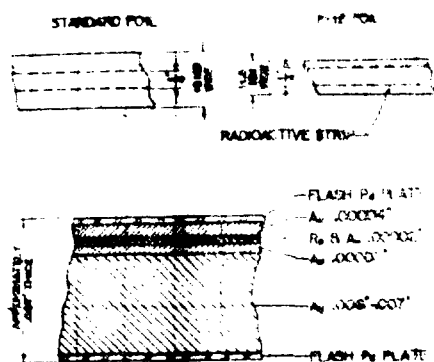
The current widespread industrial utilization of radium and radioisotope-activated foils is based upon the functional effects of certain basic phenomena associated with radioactive emission: The ability of alpha and beta particles to ionize gases, the specific absorption of beta and gamma radiation within materials, and the ability of alpha and beta to produce luminescence in phosphorescent and fluorescent compounds.

These phenomena have consequently led to the use of radium, radium D and polonium activated foils in various industrial static eliminators, and to the employment of radioactive foil sections as discharge-stabilizing elements in electron tubes. Thallium 204 and strontium 90 based foils are used extensively as radiation sources in many types of beta and gamma gauges which determine materials density, thickness, and the variations in liquid, slurry and interface levels within sealed containers. Finally, the burgeoning market for self-luminous light sources used in photometry, emergency marking and area delineation has signalled the use of alpha and beta-emitting foils incorporating such radioisotopes as radium, radium D, and tritium.

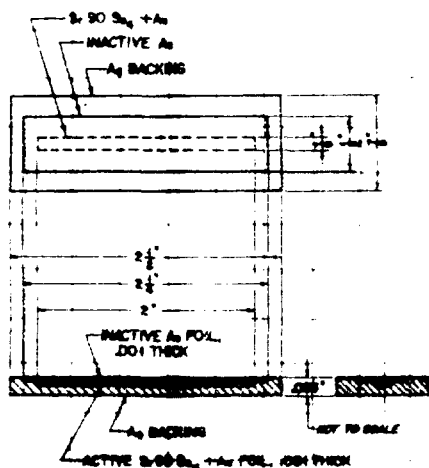
It has been our experience that the versatility of these foils permits their adaptation, at reasonable cost, to an extensive range of industrial research, development, and production activities. Our radioactives section invites your further inquiries, and offers consultation, without obligation, on tentative applications. Prices of our standard radioisotope-activated foils are available upon request.

UNITED STATES
RADIUM CORPORATION

Morris Plains, N. J.



LAB-204: Typical radium-activated foil for static eliminating unit.



LAB-365: Sealed beta source utilizing Sr^{90} foil. Surfaces joined by pressure welding.

NOV 1964
LIVED
SECT.
BUT

2-19-69
3 - 3 cpm
4 - 29 cpm
5 - 113 cpm — smallest foil

5-26-69 all in plastic caps

#1 notched 2 cpm

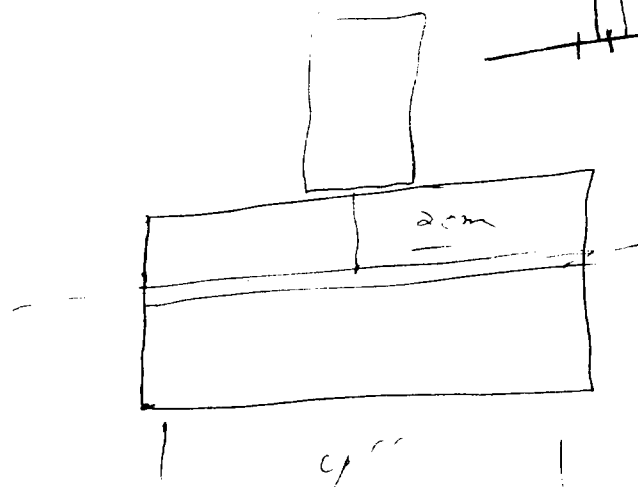
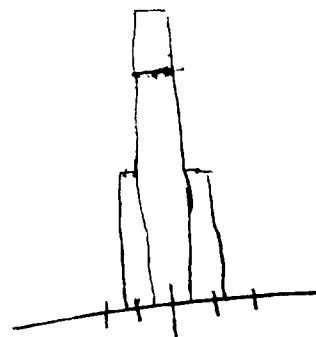
2 no mark 5 cpm

3 1/2 5 cpm

4 S-R 2 cpm

5 and one 7 cpm

one in apparatus



Ownership	ID# Exp. Date	Location	Leak Test Information			
			Date	Remarks	Date	Remarks
Yonsteltette	68034	RS040				
	March '69	KTE	9-26-68	<0.005 μ Ci	11-14-68	<0.005 μ Ci 2cpm
			2-18-69	<0.005 μ Ci	5-26-69	<0.005 μ Ci
			7-8-69	<0.005 nci	6-12-70	<0.005 nci
			12-3-70	<0.005 nci		
			6-16-71	<0.005 nci		
			brought to VA. deep Xmas north Calif.			

Source

Activity, 4 ml (total) as of 12-30-65

RCS

no mark

Source No. , P. O. #

-2-

1) Sealed

2) Plated

gold flash plate

Chemical Form

La represented
Au & Ag foil

Vendor US Ralson

Serial No.

Test Method: webster - cas flow counter location of test on capsule

back of foil

Ownership	101# Exp Date	Location	Leak Test Information			
			Date	Remarks	Date	Remarks
Tortellotto	68034	RS040				
	March '69	KIE	9-7-68	<0.005 μ Ci	11-14-68	<0.005 μ Ci
			2-18-69	<0.005 μ Ci	5-26-69	<0.005 μ Ci
			12-8-69	<0.005 μ Ci	1-12-70	<0.005 μ Ci
			12-3-70	<0.005 μ Ci		
			6-16-71	<0.005 μ Ci		
			transferred to VA. Underhill Corp, L.A., Calif			
				</		

-3)

Latex eliminato
Chemical Form La impregnated
Ac4 Ag foil

Serial No.

Test Method: not done - gas flow counter location of test on capsule back of foil

Ownership	101# Exp. Date	Location	Leak Test Information			
			Date	Remarks	Date	Remarks
Yonitellotto	68034	R5040				
	March '69	KDE	2-26-68	<0.005 μ Ci	11-14-68	<0.005 μ Ci
			2-28-69	<0.005 μ Ci	5-26-69	<0.005 μ Ci
			12-8-69	<0.005 μ Ci	6-12-70	<0.005 μ Ci
			12-3-70	<0.005 μ Ci		
			6-16-71	<0.005 μ Ci		
			Transferred to VAH with Deep, R.A. Jacif			

147 PM

5 mg

UNDER GLASS - ISOLITE

WET SWEAT

ON HOUSING

HAYS

RLS SAFE

4/10/73

20,005 MG Dg

Disposed of 10/11/73 Parcel # 147
Kentucky
Shippit to Nelson Engineering for burial

SAFETY LIGHT CORPORATION

MATERIAL SAFETY DATA SHEET

#4

PRODUCT NAME - TRITIUM FOIL OR TRITIUM TARGET (Dwg. 508-3, Titanium Tritide)

SECTION I

MANUFACTURER'S NAME SAFETY LIGHT CORPORATION		EMERGENCY TELEPHONE NO. 717/784-4344
ADDRESS (Number, Street, City, State, and ZIP Code) 4150-A Old Berwick Rd., Bloomsburg, PA 17815		
CHEMICAL NAME AND SYNONYMS Titanium Tritide		TRADE NAME AND SYNONYMS N/A
CHEMICAL FAMILY Metallic Tritide		FORMULA TiT_2

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	X	TLV (Unit)	ALLOYS AND METALLIC COATINGS	X	TLV (Unit)
PIGMENTS		N/A	BASE METAL Stn.Steel or Copper		unknown
CATALYST		N/A	ALLOYS		N/A
VEHICLE		N/A	METALLIC COATINGS Titanium		unknown
SOLVENTS		N/A	FILLER METAL PLUS COATING OR CORE FLUX		N/A
ADDITIVES		N/A	OTHERS		N/A
OTHERS		N/A			

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	X	TLV (Unit)
Thin film of metallic titanium deposited on stainless steel or copper substrate and impregnated with radioactive gas tritium (${}_1H^3$).		2×10^{-7} *
*USNRC MPC in air for insoluble forms of ${}_1H^3$ in unrestricted areas =		
2×10^{-7} microCuries/mL air		

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	unknown	SPECIFIC GRAVITY ($H_2O=1$)	4
VAPOR PRESSURE (mm Hg.)	unknown	PERCENT VOLATILE BY VOLUME (%)	unknown
VAPOR DENSITY (AIR=1)	unknown	EVAPORATION RATE (_____ =1)	unknown
SOLUBILITY IN WATER	insoluble		
APPEARANCE AND ODOR: Gray metallic color; odorless			

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel
N/A	N/A		
EXTINGUISHING MEDIA: Dry Chemical; Dry Sand - Avoid Use of Water !!			
SPECIAL FIRE FIGHTING PROCEDURES: Consult in Advance: 1) Your Radiation Safety Officer, or 2) Your Regional USNRC Office or 3) Your State Radiological Health Dept.			
UNUSUAL FIRE AND EXPLOSION HAZARDS: Avoid inhalation of air in immediate vicinity of fire			

Name(s)

Isotope 7-3

Chemical Form(s)

Building and Unit

Date expired:

P.O. # 100

mc/shipment

mc/yr.

[illegible]

FORM 8419

83 177

$${}^3_1\text{H} + {}^{232}_{90}\text{Tl}$$

Name(s) Knoll, Glenn

App1.#80 235

Isotope(s)

Address 120 Cooley Lab Nuclear Engineering

Telephone 3-5830, 4-8262, 4-6220

Chemical Form(s) Tritium Targets, ^{232}Th targets/pellets

Expires 1) NOV 30 1981

2) $6/30/86$ 3)

mCi/shipmt 6000

mCi/yr 6000

Date	Isotope	mCi	P.O.#	Date	Isotope	mCi	P.O.#	Date	Isotope	mCi	P.O.#
7-28-80	H ³	1000	567923	10/27/81	Na ²⁴ / ²⁴ Na	1000	transfer	12-22-81	U-233	1/22	None
7-2-80	H ³	1000	571408	10/8/81	In ¹¹⁶	.2	"	9-22-81	H ³	10000	X69993
8/9/80	11	1	transfer	11/6/81	Pu-Be	1000	"	2-3-81	H ³	20,000	None
12-16-80	H ³	3000	583164	11/5/81	Na ²⁴ / ²⁴ Na	.01	"	3/13/84	Pu-Be source	345	Transfer
4/27/81	H-3	10000	599930	11/10/81	Cs-137	.4	"	5/11/81	H ³	20000	11825347
12/1/81	Cl ³⁵	4	transfer	11/4/81	Na ²⁴ / ²⁴ Na	.07	"	3-15-82	H ³	10000	None
9/24/81	Pu-239	1	"	10-24-81	Na ²⁴ / ²⁴ Na	.01	"	4-19-85	237NP	.035	L11595
8/25/81	Pu-Be	1000	"	2-17-83	H ³	10000	X69993	9-13-85	H ³	18006	L26819
8/25/81	H ³	10000	"	6-2-83	U-238	.01	X73386	10/1/85	U-235	.000003	None
10/21/81	Na ²⁴ / ²⁴ Na	1000	"	11	"	.01	"	1-22-86	H ³	15000	L3224

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